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HENRY S. GRAVES, Forester.

THE FOREST RESOURCES OF THE WORLD.

BY

RAPHAEL ZON,
CHIEF OF SILVICS.

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U. S. DEPARTMENT OF AGRICULTURE,
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Washington, D. C., October 12, 1910.

SIR: I have the honor to transmit herewith a manuscript entitled "The Forest Resources of the World," by Raphael Zon, Chief of the Office of Silvics, and to recommend its publication as Bulletin 83 of the Forest Service.

Respectfully,

HENRY S. GRAVES,
Forester.

HON. JAMES WILSON,
Secretary of Agriculture.

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THE FOREST RESOURCES OF THE WORLD.

THE SITUATION.

Under present economic conditions, there is scarcely a civilized country which economically is entirely independent of all other countries. The life of all nations is now closely interwoven; and even countries like the United States or Russia, which contain within their borders practically all natural resources necessary to make them independent in every respect, are constantly interchanging their products with the rest of the world.

It is therefore impossible to form a clear idea of the possibilities of a country and its future development without taking into account the natural resources and the general economic conditions of other countries with which it comes in contact. Highly developed means of transportation make it often more profitable to obtain certain products from a country which for some reason is best able to produce them than to manufacture them at home, even though it is possible to do so.

A country deprived of certain natural resources may still be prosperous and progressive, because it is able to obtain all that it needs from other countries which have a surplus of the products which it lacks. The British Isles are the most striking example of this. With comparatively limited natural resources and high consumption of timber, grain, and other raw material, England has highly developed industries which enable her to exchange her finished products for the raw materials she needs. This in a general way holds good for forest resources, but with this difference: Forests not only produce timber, but play an important part in the life of every nation by exercising an influence on the water supplies, on agriculture, and the general health of the people. For this reason only a few countries with an insular climate, as England and Holland, may with impunity reduce their forest areas beyond a certain safety limit. Ordinarily a country with a forest area of 20 per cent or less shows to a marked degree bad climatic conditions, with prolonged droughts, frosts, and alternating floods and low water. Portugal with a forest area of only 5 per cent of the total land area, Spain with 13 per cent, Greece with 13 per cent, Turkey with 20 per cent, Italy with 14 per cent, are good examples of this.

In considering the forest resources of the United States it seems necessary, therefore, to take into account also the forest resources of all other countries in order to determine the extent to which the United States can depend, in case of exhaustion of its own timber, upon the resources of other countries, or to determine the part which it plays and will play in supplying the needs of other countries in forest products.

There is still another reason why it is important in considering the forest resources of the United States to study also the forests and economic conditions of other countries. There is a certain interrelationship between the extent and condition of the natural resources and their use. History clearly shows that in countries with abundant natural resources and sparse population there is no thought of the future, and all energy is directed to the exploitation and reckless use of what nature has abundantly provided. The waste under such conditions is naturally very great and a more economic utilization does not pay. As the population increases and industry grows, the demand for raw material of all kinds increases, and there is a gradual awakening of public opinion to the need of a more careful husbanding of natural resources. Practically all nations have traveled the same road. Some reach this point sooner than others, but every one is inevitably bound to face the same situation. The United States, being younger than European countries and endowed with abundant natural resources, was naturally backward and was until lately lagging somewhat behind. It may therefore be of advantage to this country to seek lessons for its future guidance in the experience of the older countries which have been benefited by proper care for their forests, waters, and soils.

IN EUROPEAN COUNTRIES.

The forests of Europe occupy an area of 750,000,000 acres, which is about 31 per cent, or not quite one-third, of the total land area of Europe. The most wooded country is Finland, followed by Bosnia and Herzegovina, and Sweden. The least wooded are Portugal and Great Britain.

In accordance with the proportion of forest to total land area, the countries of Europe may be arranged in the following groups:

	Per cent.
Finland	54
Bosnia and Herzegovina	50
Sweden	49
Luxemburg	41
Bulgaria, Servia, and Russia (exclusive of Finland)	30–39
Austria, German Empire, Hungary, Norway, Switzerland, and Turkey	20–29
France, Spain, Belgium, Roumania, and Greece	10–19
Netherlands and Denmark	5–9
Great Britain and Portugal	4–5

The proportion of forests decreases from the north and east of Europe toward the south and west. Russia, Finland, Sweden, and Norway together possess 583,000,000 acres of forest, or 78 per cent of the total forest area of Europe. Table 1 gives the area now under forest, the percentage of forest area, and the forest area per capita for most of the European countries:

TABLE 1.—*Extent of forests in European countries.*

Country.	Total forest area.	Forest area per capita.	Land area under forest.
	Acres.	*Acres.*	*Per cent.*
European Russia	464,610,600	4.3	36.3
Finland	52,500,000	18.75	54.4
	517,110,600		
Austria	23,996,266	.92	26.5
Hungary	18,692,000	1.17	25.7
Croatia and Slavonia	3,769,000	1.64	35.95
Bosnia and Herzegovina	6,380,000	3.99	50.5
	52,837,266		

TABLE 1.—*Extent of forests in European countries*—Continued.

Country.	Total forest area.	Forest area per capita.	Land area under forest.
	Acres.	*Acres.*	*Per cent.*
Sweden	49,390,325	9.7	48.6
Germany	34,989,675	.62	25.89
France	24,021,587	.61	18.5
Norway	16,848,000	7.00	21.00
Spain	(?)16,065,000	.88	13.00
Italy	10,115,404	.31	14.28
Bulgaria	7,602,815	2.4	30.00
Roumania	6,367,000	1.08	18.00
British Isles	3,030,000	.10	4.00
Switzerland	2,140,012	.67	20.6
Greece	2,023,380	.83	(a)
Belgium	1,303,736	.2	17.7
Portugal	1,236,600	.23	5.0
Denmark	603,575	.25	6.3
Holland	563,072	.1	7.0
Servia	3,864,774	1.55	32.0
	750,112,821		

a Less than 13 per cent.

IN NON-EUROPEAN COUNTRIES.

The forests of other countries of the Old and New Worlds, except in a few localities, are little explored, either as to quantity or quality of the timber. In Asia, the possessions of Russia, British India, and Japan lead in amount of forests. The following table shows the extent of the forest area in the continents outside of Europe in the Old and New Worlds:

TABLE 2.—*Extent of forests in countries outside of Europe.*

Country.	Forest area.	Forest area per capita.	Land area under forest.
Asia:	*Acres.*	*Acres.*	*Per cent.*
Asiatic Russia	348,030,000		
India (Schlich)	149,000,000	0.6	24.0
Ceylon	6,762,880		
Japan	57,718,410		
Philippines	49,000,000		
Malay States	101,560		
Straits Settlements	88,320		
Cyprus	448,000		
Australasia:			
British Australasia	126,720,000		19.8
Java	4,920,000		
Hawaiian Islands	1,224,992		
Africa:			
Cape Colony, Natal, Swaziland, and Transvaal	640,502		
Mauritius	87,680		
Madagascar	25,000,000		19.0
Barbary States	9,526,865		
Central Africa	224,000,000		
South America (tropic)	528,000,000		
West Indies	42,668,800		66.6
North America:			
Canada	799,360,000		38.0
Mexico	25,000,000	1.8	5.1
Alaska	107,000,000		
United States	545,000,000		29.0
Total	3,050,298,009		

As may be seen from this table, the non-European countries possess a forest area of over 3,000,000,000 acres. This with the 750,000,000 acres of European forests, form an enormous total of almost 4,000,000,000 acres, or 24 per cent of the total land area of the world. If to this we add the forests of China, Korea, South America, and Africa, for which there are no available data, the extent of the forests of the world will be still greater. Unfortunately, all figures for forest areas are more or less approximations. While the figures for the forests of Austria-Hungary, Germany, France, Sweden, Norway, Finland, Belgium, and Switzerland are fairly accurate, the figures for Russian, Canadian, or even for the United States forests are only approximate, and will eventually need correction as knowledge of the forest resources increases. The enormous forest areas in Russia, the United States, and Canada include a large proportion of land at present unproductive, such as swamps, burns, or lands which sooner or later will be taken up by agriculture, and which do not therefore give a true idea of the forest land proper. Also the figures which show the percentage of forest land give only an approximate notion of the distribution of forests in the country, because the proportion of forests to total land area greatly varies in different parts of the same country.

"Forest land" is usually understood to mean land covered with woody growth of economic importance. After the Glacial Period, in prehistoric times, and also according to tradition and written record, in the earliest historic times, forests occupied much larger areas than now. However, there are scientists who hold that some forests—in Europe, for instance—were preceded by prairie.

The character of the forest depends upon climate. Forests of cold and moderate regions contain fewer species and are more homogeneous in composition than those in tropical regions. True tropical forests are found in some parts of India and in the basins of the large rivers of South America and Africa. In Java, Borneo, Kongo, and along the Amazon and Oronoco the forests are extremely rich in variety of species.

In the world market the wood of common trees has the greatest economic importance. Pine, spruce, larch, and fir are used for construction purposes; oak, birch, hickory, and others are used by woodworking industries. The amount of rare, precious wood which is used in international trade is comparatively small.

The various countries of the world may be separated into two groups in accordance to the relation of their wood exports to their wood imports.

The countries whose wood exports exceed their imports are: Austria-Hungary, Canada, Sweden, Russia, Finland, the United States of America, Norway, Bosnia-Herzegovina, Roumania, and Japan; the countries whose wood imports exceed their exports are: The United Kingdom, Germany, France, Belgium, Spain, Italy, Holland, Denmark, Switzerland, Australian colonies, China, Greece, West Indies, Bulgaria, Servia, and British possessions in Africa.

In determining the forest resources of European countries it was impossible to obtain any figures which would show the total stand in cubic feet or board measure. In most European forests the cutting of timber is confined either to the annual growth or to a fraction of the annual growth and does not take into consideration the forest capital which produces this growth. The Europeans use the annual growth as the criterion of the present stand.

The forest capital itself, or what we call the present stand, is a constant quantity which is not to be disturbed. With improvement of the forest capital (more fully stocked or faster-growing species), the annual growth increases and more timber is available for annual cutting.

In this country and Canada, where there are still large areas of mature timber and but little forest management in the strict sense of this word, the present stand in cubic feet or board measure is of special interest, as it shows how much virgin timber is available for cutting and how long it will take to exhaust the supply.

In order to make the results obtained for different countries comparable it was attempted in every case to show the forest area, the annual growth, and annual cut, and from these three factors to make deductions as to the forest resources of the different countries. The topics discussed for each country are as follows: Forest area; distribution of the forest throughout the country; composition and character of the forests; annual consumption, cutting, and growth per acre; and wood prices.

FOREST RESOURCES BY COUNTRIES.

Austria-Hungary.

Austria-Hungary is the greatest wood-exporting country in the world. It is not so rich in forests, however, as Sweden, although some provinces in Austria are very well wooded indeed. The combined forest area of Austria, Hungary, and Croatia and Slavonia, exclusive of the provinces of Bosnia and Herzegovina, is 46,440,000 acres, or 30.24 per cent of the total land area. The forests of Austria proper, however, are very different from those of the Hungarian Kingdom, and it will be better to consider the two separately.

AUSTRIA.

FOREST AREA.

Forestry has developed differently in various parts of Austria. In the northwest provinces, such as Bohemia, Moravia, and Silesia, where the population is denser than in any other part of the empire, the forests were early taken care of. Being close to Germany, these northwest provinces have followed Germany in the management of their forests, and some of them were almost model forests even as early as 1848. In the mountainous parts of the country, however, the conditions do not favor rational forest management, and forestry there is far from being what it should be.

DISTRIBUTION.

The distribution of forests is very uneven, as may be seen from the following table:

TABLE 3.—*Forest area of Austria by provinces.*

Province.	Area.
	Acres.
Danube Provinces:	
Upper Austria	1,684,241.1
Lower Austria	1,007,729.1
	2,691,970.2
Alpine Provinces:	
Salzburg	573,088.5
Tyrol	2,739,722.4
Styria	2,654,118.9
Carinthia	1,129,104.9
Carniola	1,093,119.3
	8,189,154.0
Sea Provinces:	
Goritz and Istria	570,345.3
Dalmatia	945,661.5
	1,516,006.8
Northwest Provinces:	
Bohemia	3,725,190.0
Moravia	1,507,531.5
Silesia	430,293.6
	5,663,015.1
Northeast Provinces:	
Galicia	4,829,265.9
Bukovina	1,106,854.2
	5,936,120.1
Total	23,996,266.2

COMPOSITION OF FORESTS.

The forests are composed principally of conifers, such as spruce, pine, and fir. The coniferous forests occupy 16,868,700 acres, while the hardwood forests of seedling origin occupy only 3,522,400 acres. The hardwood forests contain oak, maple, beech, birch, locust, and alder.

CHARACTER OF FORESTS.

The State owns only 10.7 per cent of the forests, or 2,573,000 acres; of this amount, the actual property of the State is only 1,620,000 acres; the rest is bought by the Government with religious funds in its hands and is under its control. Communes own 14.4 per cent of all forests; hereditary and church forests form 13.6 per cent of the forest area, while in the hands of private owners there is 61.3 per cent of the total forest area. Of the latter, 32.4 per cent is in the hands of large owners, and 28.9 per cent in the hands of small owners. The State takes better care of its forests than does any other owner; the forests that belong to churches and large owners receive next best care. The management of communal forests and of those belonging to small owners is poor.

Austria is a good example of the influence of railroads on the exploitation of forests. Thus, before railroads were built in the forested sections of the country, wood was the only fuel, and saw timber was frequently cut for firewood. With the building of railroads, coal was substituted for wood as fuel, and this brought a change in the utilization of the forests. The consumption of firewood by the city of Vienna may be of interest in this connection. Thus, while on an average for the decade 1848–1857, Vienna, then with a much smaller population than now, consumed each year 200,170 cords, of which 77,841 cords were beech wood; for the decade 1888–1897, the annual consumption of wood in Vienna fell to

51,708 cords, of which only 17,563 cords were beech wood. The price of beech firewood during these two periods was $8.76 and $8.01 per cord, respectively, and of soft woods during the same periods was $5.33 and $7.23 per cord, respectively. This decrease in the consumption of firewood and beech wood was due to increase in the consumption of coal and to the fact that beech in the fifties was rarely used for anything but firewood; therefore, the best beech trees were consumed for this purpose. Now beech finds many uses, and is in great demand in the manufacture of furniture and other products; only the poorest grades are now cut for firewood.

Of the 23,996,266 acres of forest, 20,390,867 acres are managed as high forest, and 3,605,399 acres as coppice and composite forest.

PRESENT STAND AND ANNUAL GROWTH.

The average yearly growth of all the Austrian forests is given as 1,041,234,000 cubic feet, or 42.4 cubic feet per acre. Timber forms 45 per cent of this annual growth. The forests under different management produce different amounts. High forests produce 42.4 cubic feet per acre, of which 45 per cent is timber; composite forests (coppice with standards), 35.3 cubic feet per acre, of which 20 per cent is timber; and coppice, 32.5 cubic feet per acre, of which only 11 per cent is timber. The least growth is in Dalmatia, where of the total forest area only 7.4 per cent is high forest; and the same is true of Gorowitz and Istria, the other sea provinces. In the Tyrol Mountains the forest is scattered and the annual growth is not large, mainly because large areas are devoted to grazing. The total annual growth in the state forests has been estimated lately at 96,767,000 cubic feet. This, divided by the present area of state forests (which is 2,573,100 acres), gives 37.5 cubic feet per acre. There are, of course, districts where the annual growth in the state forests is as high as 70 cubic feet per acre.

ANNUAL CUT.

According to the latest figures, the annual cut in the Austrian forests varies from 1,413,000,000 to 1,580,000,000 cubic feet of wood, which amounts to from 60 to 67 cubic feet per acre. Since the average growth per acre is estimated at 42.4 cubic feet, this indicates that the forests are being overcut.

HOME CONSUMPTION.

In order to determine the home consumption of Austria, the exports must be deducted from the total cut. Since, however, the export figures are not given for Austria proper, but for Austria-Hungary as a whole, only the home consumption of the entire Empire can be calculated, and this will be given under the discussion of the forest resources of Hungary.

The consumption of wood grows every year—not for firewood, as previously, but in such forms as ties for railroads and timber for the construction of railroad stations and cars. The consumption for railroads alone is estimated to be over 35,000,000 cubic feet each year. The paper and pulp factories now demand constantly increasing amounts of timber.

WOOD PRICES.

In upper and lower Austria, Styria, and Silesia the following prices prevail; the prices are per cubic foot at the place of cutting in the woods, but include the cost of transportation to the point of shipment along the road:

Average price of soft woods (in logs) per cubic foot.

	Cents.
1848	2.35
1870	4.70
1897	6.39

Average price of cord wood per cord.

	1848.	1870.	1897.
Hard woods	$1.90	$3.27	$4.63
Soft woods	1.42	2.42	3.41

In Bohemia and Moravia the following average prices prevail for timber per cubic foot and for firewood per cord:

	1848.	1870.	1897.
Timber:			
Hard woods (in logs)	$0.058	$0.087	$0.115
Soft woods (in logs)	.034	.054	.08
Firewood:			
Hard woods	2.63	4.20	4.91
Soft woods	2.03	3.06	3.98

In Galicia the wood prices per cubic foot are as follows:

	1870.	1897.
Timber:		
Hard woods (in logs)	$0.038	$0.084
Softs wood (in logs)	.028	.059
Firewood:		
Hard woods	1.56	2.92
Soft woods	1.28	4.00

The figures show that the prices of forest products throughout Austria have increased to a great extent in the last fifty years. However, the price of timber has risen much faster than the price of firewood; thus, while timber prices in many localities have trebled, the price of cord wood has only doubled.

In Galicia the prices of saw logs and cord wood have doubled in the twenty-seven years between 1870 and 1897.

HUNGARY.

FOREST AREA AND COMPOSITION.

According to the latest figures available, the forest area of Hungary is 18,692,000 acres. In this are not included the forests of Croatia and Slavonia, which are a part of Hungary. The forests of Croatia and Slavonia include 3,769,000 acres. Since 1885 the forest area of Hungary, with Croatia and Slavonia, has decreased by 54,000 acres. In the northern part (in the Carpathian Mountains) the forests are chiefly hard woods, consisting of beech (1,463,400 acres), oak (1,374,300 acres), pine and spruce (1,776,600 acres), birch (72,900 acres), poplar and willow (27,000 acres), alder, maple, and locust (203,000 acres). The hard-wood forests of the Carpathian Mountains are managed as high forest and yield timber of excellent quality.

Hard woods also predominate in the forests of eastern Hungary. The principal species there are beech (5,891,400 acres), oak (2,772,900 acres), spruce and pine (2,421,300 acres), birch (283,500 acres), willow and poplar (64,500 acres), alder, maple, elm, locust, basswood, and larch (70,200 acres).

The lowland forests are mainly of poplar, willow, oak, locust, and beech, in all about 580,500 acres. In the forests of the western part, between the rivers Danube and Drave, hard woods also prevail. Beech occupies 596,700 acres, oak 866,700 acres, spruce and pine 2,800 acres, willow and poplar 89,800 acres, birch 86,400 acres, all other species 72,900 acres.

The areas under different species show clearly that Hungary is principally a hard-wood region, while Austria is principally a coniferous region in which conifers form 82 per cent of the total forest.

Of Hungarian forests 1,182,600 acres are proclaimed as protection forests; 272,100 acres are on shifting sand; 16,889,800 acres are on forest land proper; while 4,116,500 acres are on soil which can not be called absolute forest land.

The forests of Croatia and Slavonia, which form the southern part of Hungary, extend between the rivers Drave and Save, and consist chiefly of hard woods. Coniferous forests occupy only 456,300 acres out of 3,769,000 acres of the total forest area.

Following are the areas occupied by the different species for Hungary and Croatia and Slavonia separately and for the Hungarian Kingdom:

Distribution of forests by States and for Kingdom.

Species.	Hungary.	Croatia and Slavonia.	Hungarian Kingdom.
	Acres.	*Acres.*	*Acres.*
Oak forests	5,200,200	828,000	6,028,200
Beech and other hard woods (except oak)	9,247,500	2,484,000	11,731,500
Coniferous forests	4,244,300	457,000	4,701,300
Total			22,461,000

Thus the Kingdom of Hungary has 26.8 per cent of the total forest area under oak, 52.2 per cent under beech and other hard-wood species, 20.8 per cent under conifers, and 0.2 per cent underbrush.

The following areas are managed in the Kingdom as high forest: 3,510,000 acres of oak, 8,367,000 acres of other hard woods, 4,649,400 acres of spruce and pine; the rest, 5,934,600 acres, is in composite and coppice forest, of which 25 per cent is simple coppice.

The forests are distributed according to ownership as follows:

Distribution of ownership by States and for Kingdom.

	Hungary.	Croatia and Slavonia.	Hungarian Kingdom.
	Acres.	*Acres.*	*Acres.*
State forest	2,859,000	724,000	3,583,000
Communal forest	3,745,000	394,000	4,139,000
Church forest	1,207,000	92,000	1,299,000
Private and corporation forest	10,881,000	2,559,000	13,440,000

ANNUAL GROWTH AND PRESENT STAND.

Approximate estimates of the annual growth were made in 1882 and 1894; they do not differ essentially. On an average, 1 acre of forest in Hungary yielded 44.4 cubic feet, and in Croatia and Slavonia 43.4 cubic feet. The annual yield per acre in coniferous forest was estimated at 58.5 cubic feet, that of oak forest 41.5 cubic feet, and all other forest 40 cubic feet. In the state forests the different species were found to yield the following grades of wood:

	Saw logs.	Cord wood and wood for charcoal.
	Per cent.	*Per cent.*
Oak	25 to 40	75 to 60
Beech	3 to 15	97 to 85
Conifers	70 to 85	30 to 15

These figures show that conifers yield the largest percentage of saw timber, and for this reason Hungary with its hard-wood forests can not export large quantities of structural timber, which must be secured chiefly from Austria. The total annual growth is given as 1,000,000,000 cubic feet.

ANNUAL CUT.

There are no figures available for the total cut in all the forests of Hungary proper. In the state forests the annual cut per acre is 30 to 33 cubic feet per acre, which is less than the annual growth.

ANNUAL CONSUMPTION.

There are no figures for the annual consumption in Hungary alone, so it will be considered together with Austria for the entire Empire.

WOOD PRICES.

Timber brings fairly good prices. Thus oak, the most valuable of all timber trees, is sold in southern Hungary on the stump at 6½ to

11 cents per cubic foot; in Slavonia, at from 11 to 17½ cents per cubic foot. The market prices of saw timber vary from 44 to 55 cents per cubic foot, and sometimes go even as high as 77 cents. Coniferous wood does not command as high prices and is sold at 3.4 to 6.7 cents per cubic foot on the stump, while the finished product in the lumber yard brings as high as from 16½ to 44 cents per cubic foot.

The prices per cubic foot vary according to the species and the kind of wood, as may be seen from the table below:

Prices of lumber and cord wood on stump and in yard.

	On stump.	In lumber yard.
LUMBER.	*Cents.*	*Cents.*
Oak	3.8 to 11.2	9.0 to 13.7
Beech	8.7	11.0
Elm and maple	3.7 to 11.2	7.3 to 13.5
Spruce and pine	1.7 to 6.2	3.8 to 8.4
Larch	2.2 to 8.3	5.0 to 10.0
CORD WOOD.		
Oak	$0.60 to $3.20	$2.07 to $4.02
Beech	$1.31 to $2.60	$2.07 to $4.01

In Croatia and Slavonia the stumpage is given as somewhat higher, especially for oak saw logs and oak staves.

BOSNIA AND HERZEGOVINA.

In considering the forest resources of Austria-Hungary one must mention also the two Provinces under the control of Austria—Bosnia and Herzegovina.

The forests of Bosnia and Herzegovina occupy 6,380,000 acres, of which 5,016,500 acres are state forests and the remaining 1,363,500 acres form private property.

In the state forests 3,572,000 acres are high forest and 1,444,500 acres are coppice. The private forests have 351,000 acres of high forest and 1,012,500 acres of coppice.

The annual cut amounts to 7,487,000 cubic feet of coniferous species, 1,413,000 cubic feet of oak, and 9,006,000 cubic feet of beech, besides a large amount of oak bark for tanning. The exploitation of the forests of Bosnia and Herzegovina is just beginning. Twenty years ago they were hardly used at all.

ANNUAL CUT AND CONSUMPTION FOR THE EMPIRE OF AUSTRIA-HUNGARY.

According to the latest data, the annual cut in all of the forests of Austria-Hungary, including Bosnia and Herzegovina, was 2,827,000,000 cubic feet of wood, or 53 cubic feet per acre. Of this cut one half was sawed into firewood, the other half made into saw logs, at an average price on the stump of 3.5 cents per cubic foot.

The exports for the period between 1895 and 1899 were, on an average, equal to 320,000,000 cubic feet on the stump. Deducting this 320,000,000 cubic feet from the total cut (2,827,000,000 cubic feet), there remains about 2,500,000,000 cubic feet of wood for home consumption. This, with a population of 43,825,000, would give a consumption of 57 cubic feet to each inhabitant. This consumption was distributed roughly somewhat as follows: 530,000,000 cubic feet were sawed into lumber, 40,000,000 cubic feet were used by the railroads, 30,000,000 cubic feet were consumed by pulp and paper mills, and the rest was used by the people as round timber for construction and fuel. These estimates, though crude, give some idea of the consumption.

CANADA.

FOREST AREA.

The forest area of Canada is estimated as 1,249,000 square miles, or 38 per cent of the total land area. Not all of this, however, is timber land; only about one-third, or 400,000 square miles, may be taken as covered with merchantable timber, the rest being brush land. According to Mr. Stewart, Superintendent of Forestry, Department of the Interior, Dominion of Canada, a very large portion of the Dominion forest lands is of little value for commercial purposes. His estimates, which are the latest and are authoritative, give only one-fifth of the 1,406,200 square miles as more or less wooded area, or only 280,000 square miles can be considered as timber land of commercial value. At an average stand of 2,000 feet b. m. per acre this would give about 360,000,000,000 board feet of mature timber.

According to Mr. George Johnson, Statistician, Department of Agriculture, Dominion of Canada, the area of forests in the different provinces is as follows:

Table 4.—*Forest area of Canada by provinces.*

Provinces.	Area of forest in square miles.	Land area under forest.
		Per cent.
Prince Edward Island	800	40
Nova Scotia	6,500	31
New Brunswick	14,800	53
Ontario	102,100	46
Quebec	116,500	51
Manitoba	25,600	40
British Columbia	285,600	75
Territories	697,100	29
Total	1,249,000	[a] 38

[a] Average.

COMPOSITION.

The Canadian forests are stocked with a large number of species, among which the three most important are white pine, found in the southeast part of the Dominion; spruce, occurring over large areas; and Douglas fir, found principally in British Columbia. Besides these there are a large number of others which play a greater or less part in the lumber trade; as, among the hard woods, ash, birch, elm, maple, beech, oak, hickory, etc. The bulk, however, is coniferous timber, as may be inferred from the fact that of the exports 94 per cent are conifers and only 6 per cent hard woods.

The principal forest areas are in the eastern and western provinces, the central part of Canada being occupied by large treeless prairies.

The forests of Canada belong chiefly to the provincial governments and to the railroads. In Manitoba and in the Northwestern Territories the forests are the property of the Dominion government and of Indian tribes.

ANNUAL CUT AND CONSUMPTION

The total annual cut as given by the census of 1891, amounts to 2,045,073,072 cubic feet, distributed among the different products as follows:

	Quantity.	Cubic feet.
Square timber..........tons..	865,896	43,294,800
Logs, masts, and spars..........pieces..	48,852,225	407,101,875
Staves..........M..	92,260	791,128
Railroad ties and fence poles..........pieces..	39,048,162	117,144,486
Telegraph poles..........do....	303,861	3,282,175
Fire, lath, and pulp wood and bark..........cords..	11,439,541	1,464,061,248
Shingles..........M..	939,736	9,397,360
Total..........	....	2,045,073,072

The exports were estimated at 613,000,000 cubic feet, which left 1,432,073,072 cubic feet for home consumption. This made a per capita consumption of 296.2 cubic feet. For the last eighteen years the cut has increased enormously. Professor Fernow estimates the present cut at about 2,400,000,000 cubic feet of finished material, which represents not less than 3,000,000,000 cubic feet as it grows in the forest, or about 17 cubic feet per acre. If to this be added the enormous loss of timber through fire, a loss estimated by some to be equal to nearly ten times the amount cut, the drain is at present probably greater than their productive powers; their exploitation is at the expense of the forest capital itself. There are no figures showing the growth per acre, but it is probably at best not more than 20 cubic feet. Schlich [a] gives the total cut of wood for the year 1900, as given in the census report of 1901, as 1,211,209,625 cubic feet, of which 503,527,545 cubic feet were in the form of timber and 707,682,080 cubic feet firewood. This figure, however, can not be the complete returns for the total cut because it is much smaller than the amount given by the census of 1891; the cut since then has increased.

TIMBER PRICES.

Table 5, on the following page, conveys an idea of the prices for the different kinds of wood derived from various species, based on the data obtained in the year 1900.

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[a] Forest Policy in the British Empire, Vol. I of his Manual of Forestry.

TABLE 5.—*Quantity and value of timber and firewood in 1900.*

Class and kind of wood.	Quantity in solid cubic feet.	Value.	Value. per cubic foot.
Square, waney, or flat timber:			
Ash	416,308	$43,331.76	$0.104
Birch	1,203,564	147,044.16	.122
Elm	1,354,765	143,020.08	.105
Maple	346,433	35,990.58	.103
Oak	110,219	19,042.04	.172
Pine	2,381,310	445,389.84	.187
All other kinds	5,914,314	605,074.86	.102
Total or average	11,726,913	1,438,893.32	.122
Logs for lumber, etc.:			
Elm	8,224,100	640,421.36	.077
Hickory	165,000	19,153.26	.116
Hemlock	20,077,800	1,094,680.98	.054
Oak	1,042,100	149,605.38	.143
Pine	153,368,100	14,946,004.66	.098
Spruce	104,067,600	7,140,137.04	.068
All other kinds	78,751,600	4,968,582.12	.063
Total or average	365,696,300	28,959,184.80	.079
Miscellaneous timber:			
Wood for pulp	53,442,720	2,107,791.72	.039
Fence posts	33,357,710	564,420.96	.016
Masts and spars	313,880	28,192.86	.089
Piling	2,402,632	228,585.24	.095
Railroad ties	32,607,160	1,367,421.38	.041
Poles for electric wires	2,040,888	202,499.06	.099
Hop and hoop poles	596,074	....	....
Staves, bolts, and headings	1,343,268	23,177.34	.038
Total or average	126,104,332	4,522,088.56	.036
Total of all timber	503,527,545	34,920,166.68	.069
Total of all firewood	707,682,080	14,141,171.16	.01
Grand total of all wood	1,211,209,625	49,061,337.84	.04
Tanbark	....	427,203.72	....
Pot and pearl ashes	....	18,676.98	....
		49,507,218.54	

RUSSIA.

FOREST AREA AND DISTRIBUTION.

The forest resources of Russia are enormous. The total forest area has recently been given as 812,640,600 acres, though, as indicated below, this estimate is unquestionably excessive. The proportion of forest to total land area is 15.45 per cent. The forests are very unevenly distributed, however, as is shown by the following table:

Forest area by provinces.

Province.	Forest area.	Proportion of forests to total area.
	Acres.	*Per cent.*
Sixty provinces of European Russia	444,711,600	36.31
Caucasus	19,899,000	17.20
Western Siberia	307,530,000	30.39
Eastern Siberia	40,500,000	5.01
Total	812,640,600	25.73

This table does not include the middle Asiatic provinces, as Transbaikal, Amur, and Sakhalin, which comprise 2,316,000,000 acres, and are practically destitute of forests. The proportion of forest for the provinces which have forests is 25.73 per cent, while the proportion of forest to the total area of the Empire, without Finland, is only 15.45 per cent. The table also shows how different is the distribution of forests in various parts of the Russian Empire. Thus, while European Russia has over 36 per cent, the Caucasus has only 17 per cent, and eastern Siberia has but 5 per cent of its area under forest. The forests of European Russia are of course of the greatest value. Even there the distribution is very unequal; the five northern provinces contain practically two-thirds of the total forest area.

COMPOSITION.

The composition of the Russian forests is still very little known. In 1893, out of the 315,900,000 acres of forest in European Russia and Caucasus which were under the administration of the forest department, there was 88 per cent of conifers, 11 per cent of hard wood, and 1 per cent of openings and cuttings which did not come up to forest. In Siberia 71 per cent of the total area was under conifers, 29 per cent under hard woods. Oak occupied 3,284,682 acres, either in the form of pure forests or mixed forests in which oak predominated.

OWNERSHIP.

The State owns 643,067,100 acres, or 79.2 per cent of the total area, and only 169,573,500 acres, or 20.8 per cent, belong to other owners. The distribution of the forests according to ownership, however, varies somewhat in the different regions. Of the 444,711,600 acres in European Russia, more than two-thirds belong to the State and Crown, and only 31 per cent to private owners; in the Caucasus the State owns 13,405,500 acres out of a total area of 19,899,000 acres, or 67.3 per cent; in eastern Siberia the State owns about 76 per cent; in western Siberia the State possesses nearly all of the forests; out of 307,530,000 acres, 303,671,700 acres, or 98.7 per cent, belong to the State. Out of 643,067,100 acres of forest belonging to the State there are, properly speaking, only 341,442,000 acres of true forest land, the rest being either agricultural or swamp land. Therefore the total forest area of Russia should be not 812,640,600, but 511,015,500 acres.

Of the total forest area of European Russia, 1,269,000 acres are declared protective forests and 1,225,800 acres are watershed forests. In a similar way, in the Caucasus 81,000 acres are declared protective and 180,900 acres are watershed forests.

ANNUAL GROWTH AND ANNUAL CUT.

A comparison of the annual growth and annual cut per acre in the Russian forests shows that at present only a fraction of the annual growth is actually used. The reason is that the bulk of the forests is located in regions but poorly developed and with no means of transportation. According to the statement of the Russian administration, only a small part of the annual growth can now be used on account of lack of market. The condition in 1898 was as follows:

1. In the state forests of European Russia, over a forest area of 237,500,000 acres, the annual growth was 13.6 cubic feet per acre, of which only 40 per cent, or 5.1 cubic feet per acre could be actually marketed and used.

2. In the state forests of the Caucasus, with 13,250,000 acres of forest, out of a possible yield of 38.4 cubic feet per acre, only 16 per cent, or 6.2 cubic feet per acre, was actually used.

3. In the state forests of western Siberia, with an area of 95,000,000 acres, out of a possible yield of 3.1 cubic feet per acre only 40 per cent, or 1.3 cubic feet, was actually cut and used.

More wood is used in other forests than in those owned by the State, but these amount to only about one-third of the total forest area. In all forests not under control of the Government the cutting is heavier than in those owned by the State. In the following table are given the cut per acre and the total cut in the different kinds of forest:

Annual cut in cubic feet per acre and total cut by ownership.

	Cut per acre.	Total cut.
State forest	5.15	1,249,994,000
Crown forest	10.75	201,267,000
Communal forest	11.15	98,868,000
Peasant forest	18.59	910,405,000
Private forest	37.04	4,554,990,000
Total		7,015,524,000

Thus the annual cut in European Russia is about 7,000,000,000 cubic feet for the productive forest land (412,000,000 acres), or 17 cubic feet per acre. On the other hand, the total annual growth for the same area is estimated at 12,711,000,000 cubic feet, or about 31 cubic feet per acre. In other words, the cutting in these forests is a little more than one-half of what is produced each year.

In the forests of Asiatic Russia the exploitation is practically nil, hardly amounting to 1.3 cubic feet per acre.

CONSUMPTION.

If from the 7,000,000,000 cubic feet annually cut in the forests of European Russia is deducted the annual export of 423,720,000 cubic feet, the remainder is a home consumption of 6,576,280,000 cubic feet. This, with a population of 104,000,000, gives a per capita consumption of 63 cubic feet. Assuming that one-half of the annual growth (12,711,000,000 cubic feet) is saw-log timber, there is produced annually 6,355,500,000 cubic feet of such material. With a home consumption of about 25 cubic feet of saw logs per capita, the total would be 2,600,000,000 cubic feet, which would still leave 3,755,500,000 cubic feet available for export. At present the wood deficit in all European countries together amounts in logs to about 1,412,000,000 cubic feet per annum. This deficit may become three times as large, and still European Russia could apparently furnish enough timber for the countries which depend on importations for their supply.

WOOD PRICES.

In the yearbooks of the Department of the Treasury for 1898 and 1900 are given stumpage prices. Thus, in 1895, in the remote northern government of Archangels, 1 cubic foot of pine timber on the stump was worth 2.7 cents; in 1898, 3.7 cents; in 1895 spruce was selling for 1.9 cents, and in 1898 for 2.1 cents; pine cord wood was worth on the stump 18 cents per cord. In another northern and remote government, Olonezk, timber on the stump was worth 3.5 cents per cubic foot for pine and 2 cents for spruce. In the government of St. Petersburg the stumpage price was 3.7 cents for pine and 2.2 cents for spruce.

In the central governments the stumpage prices were, of course, much higher. Thus, in the government of Moscow the stumpage price for firewood was given in 1898 as $1.60 per cord for pine wood, $1.21 per cord for spruce, $1.16 per cord for oak, $1.70 per cord for birch wood, and 33 cents for all other species; saw-log timber in the same year was worth 6 cents per cubic foot for pine, 3.7 cents for spruce, 2.5 for all other species. In the government of Petrokovsk firewood was selling for $2.31 per cord for pine on the stump, $2.13 per cord for spruce, $3.23 for oak and birch; saw-log timber was selling for 9.8 cents per cubic foot for pine and spruce and 12.3 cents per cubic foot for oak.

These figures give an idea of the range of prices for timber and firewood in the Russian Empire. Stumpage prices have now reached such a point that further advance is hardly to be expected. There are, of course, many places here and there, remote from means of transportation, where forests are still cheap; but as soon as a railroad is built the price of land, and with it the price of timber, will jump at once.

FINLAND.

FOREST AREA.

Finland, although politically part of the Russian Empire, has had an independent economic development.

The forest area may be given as 52,500,000 acres, or 54.4 per cent of the total land area, and 18¾ acres per capita. The State in all owns or controls 32,117,500 acres, or about 61.2 per cent of all the forest area. The rest, 38.8 per cent, belongs to private owners. The forests extend only to the sixty-ninth degree north latitude. Only a few species, like birch, extend farther north. The forests are composed almost exclusively of pine, spruce, birch, and, to some extent, alder. The most valuable species is, of course, the pine, which is, however, of very slow growth. It takes the pine from eighty to two hundred years to reach sizes suitable for construction, and from one hundred and forty to one hundred and eighty years to make saw logs. The farther north it is, the slower, of course, is its growth. As a rule, the spruce occupies more fertile soil than the pine and reaches its development in a much shorter time.

ANNUAL GROWTH AND CUT.

The cut in the state forests for 1897 amounted to 25,737,000 cubic feet, or 0.74 cubic foot per acre. In the northern forests the cut per acre was only 0.43 cubic foot, while in the rest of the forests there was cut as much as 3.44 cubic feet per acre. Of the total cut, 7,837,000 cubic feet formed cord wood.

In the 20,382,500 acres of private forest there was cut approximately 343,000,000 cubic feet each year, or about 17 cubic feet per acre.

The annual growth per acre for all the forests in the country can be considered as about 19.8 cubic feet per acre. From these figures it can be seen that while in the state forests the cut is considerably below the annual growth, in private forests the annual growth is only a trifle more than the cut.

CONSUMPTION.

The total cut in both private and state forests may be estimated at between 369,000,000 and 379,000,000 cubic feet each year. The exports amounted to about from 132,000,000 to 142,000,000 cubic feet, which, deducted from the total cut, would leave about 237,000,000 cubic feet for home consumption, or 91.5 cubic feet per inhabitant.

WOOD PRICES.

The statistical yearbooks of Finland give the prices of finished sawed lumber. Below are the prices for the period between 1886 and 1897, per cubic foot of sawed boards:

	Cents.		Cents.
1886	9.5	1893	12.8
1887	11.1	1894	12.8
1888	9.7	1895	12.2
1890	14.7	1896	12.6
1891	11.8	1897	13.4
1892	12.6		

SWEDEN.

FOREST AREA.

Up to 1897 Sweden was in the lead of all countries exporting timber. In 1898, however, the exports began to lag behind those from Austria-Hungary, which at that time began to increase enormously.

The lumber industry of Sweden is comparatively young and has grown up in, perhaps, the last forty years. The country is very rich in forests, but the bulk of them lie in the north, and on account of lack of roads are not easily accessible. It is only with the building of railroads that the present exploitation of the northern forests became possible. The driving of logs in the little streams of the north offers great difficulties, but still these streams are used extensively for this purpose in the same way as are those of Maine and northern New York.

The distribution of forests by provinces, the forest area, and the area per capita are shown by Table 6.

TABLE 6.—*Forest area of Sweden by per cent of land and per capita by provinces.*

Province.	Acres.		Per cent of total area under forest.	Forest area per capita in 1898.
	1890.	1898.		
				Acres.
Stockholm	1,011,752.1	1,012,216.5	54.8	2.21
Upsala	697,871.7	692,298.9	54.7	5.56
Sodermanland	691,869.6	715,022.1	46.1	4.32
Ostergotland	1,526,774.4	1,532,152.8	62.2	5.54
Jonkoping	564,129.9	733,549.5	27.9	3.65
Kronoberg	605,915.1	607,999.5	27.6	3.81
Kalmar	882,754.2	1,389,600.9	51.3	6.08
Gothland	365,261.4	341,188.2	44.3	6.51
Blekinge	281,358.9	280,978.2	39.3	1.92
Kristianstad	486,939.6	507,338.1	33.0	2.32
Malmohus	143,448.3	152,220.6	13.0	.38
Halland	169,965.0	187,987.5	15.9	1.32
Goteborg	285,975.9	288,189.9	23.8	.89
Elfsborg	1,092,833.1	1,328,445.9	45.5	4.75
Skaraborg	728,546.4	740,545.2	37.1	3.05
Wermland	3,455,462.7	3,368,970.9	77.7	13.23
Orebro	1,255,362.3	1,276,605.9	62.3	6.62
Westmanland	904,502.7	848,650.5	53.1	6.62
Kopparberg	4,823,784.9	5,133,777.3	73.8	24.08
Gefleborg	3,556,583.1	3,694,337.1	81.7	16.01
Westernorrland	3,926,545.2	4,374,361.8	73.4	19.28
Jemtland	4,866,169.5	7,259,992.2	61.8	66.34
Westerbotten	5,414,569.2	5,696,557.2	41.3	40.64
Norbotten	6,853,885.2	7,227,338.4	29.4	57.59
Total or average	44,592,260.4	49,390,325.1	48.6	9.7

The proportion of forest to total land area, as can be seen, is enormous, being 48.6 per cent. The forest area per capita of population is given as 9.7 acres. This explains why Sweden is capable of carrying on such a large international trade in forest products with the whole world, sending timber even to Australia, Africa, and South America. The forest area diminishes from north to south. Its distribution per capita varies in different provinces, in some being as high as 66 acres and in others less than one-half an acre.

In 1890 the state forests comprised 18,058,000 acres; in 1898 the area had increased to 18,641,000 acres. Of this amount the State actually owned 10,063,000 acres, while the remaining 8,578,000 acres were either the joint property of the State and of institutions or were merely under state control. The forest area which is owned jointly by the State and private individuals amounted to 2,295,000 acres. There are more detailed data for the state forests and those under state control than for any other class.

COMPOSITION.

Conifers occupy 80 per cent of the forest area; north of the line from Christiania to Upsala (60° north lat.) is the coniferous region. Birch, aspen, and mountain ash form the uppermost vegetative limit in the northern alpine region. Spruce (*Picea excelsa*) forms the limit of coniferous growth and borders upon the birch region. Pine (*Pinus silvestris*) grows along the rivers. In the central part both pine and spruce occur in pure stands, while along the coast and toward the south they form mixed stands. Oak and beech, in mixture with conifers, are found in the south.

ANNUAL GROWTH AND CUT.

The following table gives an idea of the cut per acre in the state forests and those under state control for the period from 1889 to 1898:

Annual cut, in cubic feet, in forests under state control.

Year.	Total cut.	Cut per acre.
1889	44,080,000	4.37
1890	34,906,000	3.15
1891	39,143,000	3.55
1892	42,882,000	3.85
1893	38,647,000	3.48
1894	46,196,000	4.15
1895	46,674,000	4.04
1896	60,374,000	5.19
1897	67,117,000	5.74
1898	75,532,000	6.11

As may be seen from these figures, the amount cut per acre grows every year, and it now reaches an average of 6.11 cubic feet per acre. It must be remembered that the state forests are found chiefly in the north, and that of the 8,578,000 acres of state forests in 1890 there were 3,537,000 acres which were swamp land.

The sale of timber in the state forests is either by annual auction sales, or otherwise, to supply the needs of the local population in fuel, and a small amount of timber for construction, or the timber is sold by contract; the latter method is practiced chiefly in the two most northern provinces.

The average amount of timber, not counting waste, cut each year in all of the forests may be taken as 954,000,000 cubic feet, or 19.1 cubic feet per acre. The annual cut of wood for 1897 was figured roughly as follows: Export of timber (in logs), 246,863,000 cubic feet; export of finished products (except pulp wood), 3,532,000 cubic feet; wood for pulp and paper, 200,845,000 cubic feet; timber for railroads, 50,114,000 cubic feet; and wood for all other purposes, 559,874,000 cubic feet, making a total of 1,061,228,000 cubic feet.

This figure is larger than the one given above (954,000,000 cubic feet) as the annual cut; the difference is due to the fact that in the latter case the amounts were given in the rough, including waste, which in some cases is very great. In the northern parts, where there are no means of transportation, the part of a tree which can not be utilized is often as high as 40 per cent, almost as much as in the United States. In central and southern Sweden, however, the waste does not exceed 5 per cent.

The average annual growth in all the forests is greater than the annual cut per acre. The annual growth has been estimated at 25 cubic feet per acre; therefore the annual cut could be increased to 1,235,500,000 cubic feet without depleting the forests.

CONSUMPTION.

If we add to the amount of timber exported in the form of logs and lumber the amount of pulp wood also, the total exports would amount to 350,000,000 cubic feet. If we deduct this amount from the total annual cut of 954,000,000 cubic feet, the remainder represents a home consumption of 604,000,000 cubic feet, or 120 cubic feet per capita. If we include also the waste involved in the production of the total annual cut, the per capita consumption would probably be as high as 140 cubic feet. K. von Scherzer[a] estimated the consumption in Sweden (in the eighties) at 101 cubic feet per inhabitant. Mulhall[b] gives the consumption in Sweden and Norway as 92 cubic feet per inhabitant. Since these estimates were made the home consumption in Sweden has increased considerably, and 120 cubic feet per capita may be considered as near the truth.

WOOD PRICES.

Unfortunately there are no recent figures for stumpage prices of timber or wood. The latest available figures are for the year 1890. The following table gives the prices of timber on the stump for the whole tree and by the cubic foot:

Prices of saw-log timber.

District.	Maximum price of saw-log timber.		Minimum price of saw-log timber.	
	Per whole tree.	Per cubic foot.	Per whole tree.	Per cubic foot.
		Cents.		*Cents.*
Norbotten	$0.39	1.6	$0.24.2	0.9
Westerbotten	1.39		.52.0	
Mellerstra-Norrland	1.73 to 1.92		$0.39 to .52.0	
Gefle-Dala	1.42 to 1.78		.52 to 1.04	
Bergsland	1.35	5.27	.54.0	
Ostra	1.22 to 1.42		.39 to .52.0	
Vestra		2.9		1.72
Smaland	.52 to .78			

In the district of Sodra the oak wood was sold on an average for 2.57 cents per cubic foot. In the district of Vestra cord wood was sold from the woods at 2.75 to 2.87 cents per cubic foot. In 1892 average auction prices for different kinds of wood were as follows:

Auction prices of timber in 1892.

Districts and provinces.	Timber in the square, per cubic foot.	Sawed timber, per cubic foot.	Timber for construction, per cubic foot.	Cord wood, per cord.
	Cents.	*Cents.*	*Cents.*	
Norbotten	2.2 to 4.4	1.0 to 2.3	0.4 to 1.7	$0.18 to $0.36
Westerbotten	3.7	1.1 to 3.6		.34 to .45
Mellerstra-Norrland	5.1 to 7.3	2.2 to 7.2	.7 to 3.4	
Gefleborg		2.7 to 8.1		.21 to .93
Kopparberg		2.6 to 4.9		.76
Wermland		2.6 to 3.4		3.58
Orebro	2.6	2.9 to 3.6	2.2 to 3.6	1.77
Westmanland		2.9		1.47
Upsala	2.2	3.6 to 3.9	2.5 to 4.0	1.10 to 1.83
Stockholm		3.2	2.9	1.96
Ostergotland	2.9	3.7	3.2	
Gothland		3.7	3.2	1.96
Skaraborg	2.6 to 3.6	2.6 to 3.6	2.9 to 3.6	1.40 to 4.57
Kalmar	3.6 to 6.0	1.6 to 4.8	4.0	.37 to 3.08
Jonkoping		1.7 to 2.2	1.7	1.85
Kronoberg		1.5		1.36

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[a] Das wirtschaftliche Leben der Völker, Leipzig, 1885.

[b] Dictionary of Statistics.

The lowest prices for wood were, as would be expected, in the north. In a book [a] published for the Paris Exposition the price of export sawed timber of third quality from 1873 to 1898 was as follows: In 1873, 18.1 cents per cubic foot; in 1874 it was 26.8 cents. After this the price declined, until in 1879 it was only 10.5 cents. In 1883 the price again reached 18.5 cents, in 1897 it was 20.5 cents, and in 1899 it was an even 21 cents per cubic foot. In 1899 and 1900 the price was still high, but in 1901 it fell.

The north of Sweden, the so-called Norrland, is where timber is cut for export. In 1892 the export from Norrland formed 85 per cent of the total export from the Kingdom, and in 1898 was 73 per cent of the total export. With a forest area of 49,390,000 acres, of which probably not less than 10,800,000 acres must be deducted for swamp and is not forest land proper, Sweden has exported on an average for the three years 1897–1899 wood valued at $46,604,500, or at about $1 per acre. Such an export must be considered very large.

Most of the saw logs are delivered to the harbor by water. There is not a single river in Norrland [b] which is not used for log driving.

One of the greatest scourges in Sweden, as in this country, is forest fires: In 1887, 14,580 acres were thus destroyed, and in 1892, 145,800 acres.

NORWAY.

FOREST AREA.

With a total land area of 124,130 square miles, Norway possesses a forest area of 16,848,000 acres, or 21 per cent of the total land area. The bulk of the forests lies in the northeast, where the proportion of forest is 38 per cent; in the north the forest occupies only 6 per cent of the land area, and in the central part 13 per cent. The forest area per capita is 1.25 acres.

OWNERSHIP.

The state forests comprise 4,801,700 acres, or 28.5 per cent of the forest area. Over one-half of this amount is in the northern provinces of Tromsoe and Finmark, and of this only 1,970,000 acres are really productive forest land. Corporation forests occupy 775,000 acres, or 4.6 per cent; of this, 632,500 acres are productive. Private forests comprise 11,271,300 acres, or 66.9 per cent.

COMPOSITION.

Coniferous forests occupy 75 per cent and hard woods 25 per cent of the total forest area. Among the hard woods beech, elm, and oak, especially the pedunculate oak, predominate. However, the hard woods do not play an important part economically. Beech forms forests only south of Christiania, oak on the southern and eastern coasts up to 63° north latitude, and birch extends beyond the Arctic Circle inland as well as along the coast.

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[a] La Suède, son Peuple et son Industrie.

[b] L. Passarge. Schweden; Fahrt in Nordschweden und Lappland, Berlin, 1897.

The most common of all trees is the pine. It extends beyond the Arctic Circle to 70° north latitude, and forms the most northern forest in existence. It occurs all over the country. Its vertical range is also higher than that of spruce. It ordinarily reaches maturity at 150 years, but in the mountains and in the north at 200 years. The spruce does not extend beyond the Arctic Circle, and grows on the western coast only scattering or singly. In the south it can be utilized at an age of from 70 to 80 years; in the rest of the country, between 120 and 150 years.

In Norway the growth extends much farther north than in any other country.

ANNUAL CUT, GROWTH, AND CONSUMPTION.

The annual cut is given as 345,000,000 cubic feet, or 20.4 cubic feet per acre. In the forests south of latitude 65° (15 provinces) the annual growth is estimated at 20.5 cubic feet per acre—in the southwest, as much as 22.6 cubic feet; west and south of Trondhjem, at 17.9 cubic feet; north of Trondhjem, at 11.3 cubic feet. The actual utilization in this region, however, amounts to 21.5 cubic feet. The convenient access to the western coast, with its deep, sheltered fjords, caused the depletion of the forests in that region. It is estimated that during the last one hundred and fifty years 15,000 acres of private forests have been cleared each year. These figures indicate that the forests of Norway are now being overcut.

One-fifth of the total cut (69,000,000 cubic feet) is exported, and the rest, 276,000,000 cubic feet, remains for home consumption. This, with a population of 2,240,000, gives a consumption of 125 cubic feet per capita.

The peculiarity of the export is that the bulk is in the form of logs and staves and not of sawed lumber. Thus, in 1895 to 1899 the export of sawed lumber formed only 28 per cent of the total. This is in contrast to Sweden, which exports chiefly sawed lumber.

WOOD PRICES.

There are no available statistics regarding wood prices in Norway. They can not, however, be very different from those in Sweden.

The Norwegians realize that at the present cut and export, which in itself amounts to 83 cents per acre, they are cutting not only the annual growth, but the capital itself, and that therefore the forests can not last very long.

BRITISH INDIA.

FOREST AREA.

The total forest area of British East India is not known. The area of state forests under the management of the forest department is nearly 149,000,000 acres. There are extensive areas of private and village forests, but they hardly play an important part in the timber supply of the country. Since the government is owner of all land, except in places where it relinquished its right of ownership to individuals or charitable institutions, the present area of state forests probably includes the greatest part of all forests. The forest area occupies nearly 24 per cent of the total land area, and represents 0.6

of an acre per inhabitant. The state forests are divided into three classes: Permanent state forests (or reserved forests), protected forests, and unclassed forests.

The reserved forest forms only 9.5 per cent of the total land area. In the following table are given the areas of the different classes of government forests in the various provinces:

TABLE 7.—*Government forests of India, in square miles, under the control of the forest department June 30, 1903.*

Provinces.	Total area.	Reserved.	Protected.	Unclassed.	Total.	Per cent of land area under forest.
Bengal	152,453	6,014	3,567	4,033	13,614	8.9
United provinces of Agra and Oudh	105,165	4,048	30	77	4,155	3.9
Punjab	97,223	2,456	4,909	1,914	9,279	9.5
Burma	162,530	20,039	....	103,174	123,213	75.8
Central provinces and Berar	104,170	22,672	....	4	22,676	21.8
Assame	48,961	3,778	....	18,509	22,287	45.5
Coorg	1,582	410	39	121	570	36.0
Northwest frontier province	13,276	234	....	....	234	1.8
Ajmere	2,646	142	....	6	148	5.6
Baluchistan	9,403	208	....	....	208	2.2
Andaman	3,143	156	....	1,795	1,951	62.1
Totals:						
Bengal Presidency	700,552	60,157	8,545	129,633	198,335	28.3
Madras	144,389	17,923	....	1,636	19,559	13.5
Bombay	122,883	13,487	1,320	....	14,807	12.0
	967,824	91,567	9,865	131,269	232,701	24.0
Grand total (acres)	....	58,602,880	6,313,600	84,012,160	148,928,640	....

COMPOSITION.

The composition of the Indian forests is entirely different from that of the United States or of Europe. The forests are almost exclusively hardwood, although some are evergreen and some deciduous. The evergreen forests are found mainly along the west coast of the peninsula, in coast districts of Burma and Chittagong, and along the foot and lower slopes of the eastern Himalayas. The deciduous forests are found in the central part of the peninsula and of Burma and contain the most valuable timber trees, such as teak, sâl, sandalwood, red sanders, ironwood, padouk, and others. Conifers (pine, firs, and deodar) are found at the higher elevations in the Himalayas.

ANNUAL CUT AND GROWTH.

The total cut for 1905–6 amounted to 239,250,000 cubic feet, of which 171,500,000 cubic feet was in the form of fuel. Besides this there were also cut 210,000,000 bamboos. If this cut be divided by the total forest area, the cut per acre would be extremely small, 1.6 cubic feet; this figure does not really represent the true cut, however, because it is referred to an enormous forest area, of which only a comparatively small portion is actually utilized. When the cut is referred to a definite area, the cut per acre is much larger—for example, in Bengal, in the year 1899–1900, from an area of 5,707,800 acres there were obtained 7,340,000 cubic feet of saw timber, 34,566,000 cubic feet of firewood, and 21,000,000 cubic feet of bamboo, or, in all, about 11 cubic feet per acre, and, not counting the bamboo, only about 8 cubic feet per acre. Therefore, to get a better idea of the cut per acre, the total cut should be divided by the area of reserve forests (58,602,800 acres), which would make about 3 cubic feet per acre, not counting bamboo.

There are no figures for the growth per acre. From a study made on sâl, the growth per acre of sâl coppice was estimated to be nearly 30 cubic feet per acre per year. Therefore it is safe to assume that the annual growth in the Indian forests is at present larger than the annual cut.

CONSUMPTION.

The timber exports consist chiefly of teak wood, of which 52,768 tons, or 2,638,400 cubic feet, were exported in the year 1905–6. The exports of all other kinds of wood, principally of bamboo, are insignificant. If this amount be deducted from the total cut and there were no importations, there would be available 236,611,600 cubic feet for a population of nearly 300,000,000 inhabitants, or 0.8 cubic foot per capita. There are, however, some imports of timber from Canada, Sweden, and Austria, which, on an average for the five years between 1895 and 1900, formed one-eighth the value of the total exports. Of course these imports slightly raise the per capita consumption. Still the consumption and cut are very small, and the fact that saw-log timber is needed from other countries indicates the lack of structural timber.

WOOD PRICES.

The chief timber of export is teak, and its price at the point of shipment varies from about 80 to about 85 cents per cubic foot.

ROUMANIA.

FOREST AREA.

The forests of Roumania comprise 6,367,000 acres, of which the State owns 40 per cent, the Crown and communities 8 per cent, and private individuals 52 per cent. The proportion of forest to land is 18 per cent and the area per capita is a trifle over 1 acre (1.08). Of the land classed as state forests (2,711,250 acres), 1,497,500 acres are utilized, 806,250 acres are not utilized, and 407,500 acres are burned.

COMPOSITION.

Thirteen and one-half per cent of the total forest area is occupied by spruce and fir; 20 per cent by beech (also mixed with conifers); 28.3 per cent by beech, oak, and elm in mixture; 31 per cent by pure oak forests; and 7.2 per cent by other hardwood species. The conifers occur chiefly in the Alps and Carpathian Mountains, where their exploitation is very difficult. Only part of the state forests are now being utilized. The insignificant exploitation is due to lack of capital and enterprise. The Government, in order to strengthen the lumber industry, imposed a duty on timber, which increased its price, reduced its importation, and stimulated export. In the future Roumania will undoubtedly play an important part in supplying other countries with timber.

There are no data for the annual growth or consumption. Figures for the annual cut are extremely meager and unreliable.

JAPAN.

FOREST AREA.

The total forest area of Japan, exclusive of Formosa and the Kurile Islands, is 57,718,410 acres, or 59 per cent of the total area. The forests are more extensive in the northern part and are practically confined to the slopes of the mountains which form the backbone of the islands. The greater part of the forests belong to the State. The following gives the distribution of forests according to ownership:

Distribution of forests by ownership.

	Area in acres.
State forests	32,813,300
Crown forests	5,229,472
Municipal forests	4,286,885
Forests of shrines and temples	419,073
Private forests	14,969,680
Total	57,718,410

The state and crown forests are carefully managed, but the private forests are not in such a high state of perfection. In proportion to population, the forest area is quite different in the various provinces; thus in Hokkaido it is 9 acres per capita; in Aomori and Akita, 3¾ acres; in Kochi, 1 acre; in Hiroshima and Kagoshima, three-fourths of an acre; and in Kumamoto only one-half acre. The northern provinces are still rich in virgin forests.

COMPOSITION.

The forests are divided into four zones: Tropical, subtropical, temperate, and frigid.

1. The tropical forest zone extends over the whole of Formosa, the southern half of the Loochoo Islands, the Yayemaya, and the Ogasawara Islands. The banyan, sieb, and bamboo are the principal growth.
2. The subtropical forest zone comprises a portion of the Loochoo Islands, the whole of Shikoku and Kyushu, and the part of the main island lying south of 36°.
3. The temperate forest zone extends from the northern half of the main island to the southern part of Hokkaido, between 36° and 43° 5′, where the mean annual temperature ranges from 6° to 13° C.
4. The frigid forest zone occupies those parts of the northern half of Hokkaido and the Kuriles, where the average temperature does not exceed 6° C.

On the whole, the composition of the forests is somewhat as follows:

Conifers, 21 per cent; broadleaf forests, 25 per cent; conifers and broadleaf forests, 45 per cent; and sparsely stocked forests, 9 per cent.

In the state forests, the relative proportions of the different kinds of trees are as follows:

Conifers, 11 per cent; broadleaf forests, 28 per cent; mixed conifer and broadleaf forests, 49 per cent; and sparsely stocked forests or openings, 12 per cent.

ANNUAL CUT, GROWTH, AND CONSUMPTION.

The annual cut of timber for three successive years (1900 to 1902) was on an average 2,055,059,400 cubic feet, or about 35 cubic feet per acre. If Japan were not an exporting country, as it is now, at an annual cut of 2,055,059,400 cubic feet, and a population of 43,760,000 (exclusive of Formosa), the annual consumption per capita would be 47 cubic feet. As a matter of fact, exports exceed imports, but the exact amount in cubic feet is not available. The actual per capita consumption in Japan must therefore be less than 47 cubic feet, and an estimated consumption of 30 cubic feet must be close to the truth.

There are no figures of annual growth per acre for the whole country. From some working plans prepared for the different state forests it appears that stands of *Cryptomeria japonica* may produce as much as 130 cubic feet per acre per year, and those of *Thujopsis dolabrata* 100 cubic feet per year. From the fact that the Japanese manage to get excellent agricultural crops it may be inferred that they also know how to husband their forest resources and will be able to supply all of the needs of the population and their wonderfully progressive industries.

WOOD PRICES.

Below is given a table of wood prices at Tokyo for the different Japanese woods used in construction, mining, etc.

TABLE 8.—*Prices and uses of various Japanese woods.*

TIMBER.

Species.	Price at Tokyo.[a]	Used for—
Chamaecyparis obtusa ... cubic foot	$0.40	House, ship, and bridge construction.
Cryptomeria japonica ... do.	.25	Do.
Picea ajanensis ... do.	.275	House and ship building.
Larix leptolepis ... do.	.275	Ship and bridge building, telegraph poles, sleepers.
Pinus densiflora ... do.	.15	Piles, etc.
Tsuga sieboldii ... do.	.175 .20	House building, shingles, pulp.
Fraxinus mandshurica ... do.	.25	House and boat building, ties.
Juglans sieboldina ... do.	.40	Rifle stocks, furniture, carriages.

[a] Original values are given in yen. 1 yen equals about $0.50 United States gold.

BOARDS.

Cryptomeria japonica ... square foot	$0.15	Valuable furniture and ornaments.
Thuja japonica ... do.	.05	Shingles, cabinets, etc.
Zelkowa keaki ... cubic foot	.90	Ship, carriage, and house building.
Acer palmatum ... do.	.40	Implements, wagons, etc.
Fagus sylvatica var. sieboldii ... do.	.125	Boats, sleepers, foundations.
Quercus acuta ... do.	.35	Carriages, machines, implements.
Quercus crispula ... do.	.25	Fuel and sleepers.
Cinnamomum camphora ... do.	.55	Boats, cabinets, camphor.
Magnolia hypoleuca ... do.	.35	Small articles.

THE UNITED KINGDOM OF GREAT BRITAIN AND IRELAND.

FOREST AREA.

The forests of the United Kingdom occupy but a small proportion of the total land area. The area of woodlands is estimated at 3,030,000 acres, or 4 per cent of the total land area. Table 9 gives the proportion of land used for different purposes:

TABLE 9.—*Utilization of land in the United Kingdom.*

Countries.	Acres of dry land.	Acres under crops and grass.	Acres of forests.	Acres of mountain and heath land.	Acres of other lands.
England	32,380,991	24,679,966	1,665,741	2,324,624	3,710,660
Wales	4,748,468	2,810,824	181,610	1,270,470	485,564
Scotland	19,068,958	4,897,169	878,765	9,289,378	4,003,646
Isle of Man and Jersey	185,453	124,650	869	29,729	30,205
Ireland	19,322,798	15,230,591	303,023	2,226,867	1,562,317
Total	75,706,668	47,743,200	3,030,008	15,141,068	9,792,392
Percentage	100	63	4	20	13

The area under forest per capita is one-tenth of an acre. The area of woodland is smaller than that of any other European country except Denmark. Crown forests comprise only some 67,000 acres, or 2¼ per cent, which is smaller than in any other European state. There are no communal forests. Of the total forest area, 97¾ per cent, or 2,963,000 acres, is in the hands of large private owners.

ANNUAL CUT, CONSUMPTION, AND GROWTH.

The total cut in the United Kingdom for certain periods amounted to: 1855–59, 125,703,600 cubic feet;[a] 1875–79, 131,353,200 cubic feet; and 1895–99, 138,062,100 cubic feet.

Thus the average cut per acre may be accepted as equal to 45.5 cubic feet per year. Assuming that in England only the annual increment is cut, the annual growth would be equal to the total cut. Mulhull estimated that the annual growth per acre is equal to 60 cubic feet, in which case the total annual growth would be 181,800,000 cubic feet. The United Kingdom not only uses all that is cut, but is impelled to import nearly five times that amount.

The total annual consumption and the per capita consumption for a period of years are given in the following table:

Annual and per capita consumption, in cubic feet, for certain periods.

Period.	Produced at home.	Imported.	Total.	Per capita.
1855–59	125,703,600	84,037,800	209,741,400	27.2
1875–79	131,353,200	329,442,300	460,795,500	12.0
1895–99	138,062,100	533,181,000	671,243,100	14.0

Thus the per capita consumption is 14 cubic feet. Half of the total annual cut is firewood; therefore the consumption of timber is 602,212,000, and of firewood is 69,031,000 cubic feet; or the per capita consumption of timber is 12.8 cubic feet, and of fuel is 1.2 cubic feet.

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[a] Berichte über Handlung und Industrie 1900, 598.

WOOD PRICES.

Since the United Kingdom buys nearly half the total export of all the countries of the globe, the wood prices in the English market affect practically the whole world. It will, therefore, be of interest to compare the prices for the different kinds of wood imported for a long period of years. The following average annual import prices are borrowed from the Statistical Abstracts for the United Kingdom (1892–1900), covering a period of twenty-four years:

TABLE 10.—*Prices in cents per cubic foot of imported woods in the United Kingdom.*

Year.	Round and hewn logs.			Sawed lumber.	
	Pine and spruce.	Oak.	Teak.	Pine and spruce.	Staves.
1877	22.6	58.8	109.8	....	59.7
1878	19.7	55.6	92.8	....	46.2
1879	17.2	48.7	91.5	....	45.7
1880	19.5	54.4	114.5	....	42.9
1881	19.7	56.4	125.6	....	46.7
1882	20.2	58.2	121.6	25.1	48.9
1883	19.5	57.5	134.4	23.5	42.8
1884	17.4	54.5	137.0	22.1	38.8
1885	16.9	54.1	127.3	21.9	40.8
1886	14.9	53.7	115.1	20.8	38.4
1887	14.0	52.1	98.3	19.8	38.8
1888	15.0	51.1	109.3	21.1	38.7
1889	16.7	54.6	112.8	23.6	38.5
1890	15.4	53.8	106.7	22.2	40.5
1891	14.2	55.6	97.0	20.2	42.8
1892	14.2	55.6	100.9	20.6	41.2
1893	13.2	55.7	97.4	20.2	36.7
1894	12.6	57.0	99.2	20.5	38.7
1895	12.8	54.9	91.4	19.7	38.8
1896	13.4	56.0	100.4	20.8	49.8
1897	13.6	54.3	109.9	22.2	42.4
1898	13.9	53.4	111.2	22.2	43.8
1899	13.7	53.2	114.6	22.8	49.3
1900	14.5	55.4	117.7	26.3	46.9

The lowest price for pine and spruce logs was in 1894. In general, the prices of log timber imported into the United Kingdom were lower in the nineties as compared with the prices that prevailed in the seventies. This may be accounted for by a change in the kind and quantity of logs imported. In the seventies the importations consisted chiefly of large logs, while now the timber imported is generally of smaller size and a great deal of it is for mine timbers and pulp. The prices for logs are comparatively uniform. Teak is used in large quantities for the navy, and its price depends not only on the supply, but also on the demand for it. Lately there has been a great demand for the building of the navy and merchant marine, which has increased the price of teak.

The prices for sawed lumber had fallen greatly by 1895, but since then they have shown a continuous increase. The prices for staves were also low in 1894 and 1895, but lately have shown a tendency to rise. (Table 11.)

It is also of interest to compare the prices which different countries have commanded for their timber.

TABLE 11.—*Comparison of selling prices, in cents per cubic foot, of timber in various countries.*

	1896.	1897.	1898.	1899.	1900.
Pine and spruce logs from—					
Russia	15.8	16.3	16.9	17.6	18.6
Sweden	13.3	13.8	13.1	14.3	15.7
Norway	13.8	14.3	15.0	15.0	16.6
Germany	20.2	20.8	21.8	24.0	25.2
France	8.1	8.0	8.2	8.2	8.9
United States	28.6	29.2	29.0	32.6	38.2
Canada	55.0	53.0	50.7	54.3	55.0
Pine and spruce sawed timber from—					
Russia	21.9	24.1	24.1	25.0	29.5
Sweden	21.7	23.8	24.0	24.4	27.4
Norway	24.9	27.0	27.1	27.6	28.8
Germany	23.9	25.2	26.3	27.6	35.0
United States	26.4	26.6	26.8	29.2	34.1
Canada	24.4	24.7	24.5	25.1	28.7

The highest prices for hewn as well as unhewn timber were commanded by Canada and the United States, as these countries supplied the largest logs. The timber from Russia contained a great deal of small logs for mines. That from Sweden and Norway was at the lowest prices because it contained very small logs. France ships to England pulpwood only, and such timber is practically on a par with firewood. For sawed lumber, Germany and America commanded the highest prices.

Tables 12 and 13 are of interest as giving details of timber values.

TABLE 12.—*Stumpage prices, in cents per cubic foot, of timber in the south of England, 1904–1905.*[a]

	Price.
Prime clean oak, standing	50
Rougher oak	44
Clean-grown ash	60
Beech, 20 inches in diameter and upward	24 to 32
Elm	24
Good clean willow, suitable for cricket bats	60
Hard woods, small dimensions	12 to 18
Larch	24 to 28
Scotch pine and spruce	8 to 16

[a] W. Stone. From Trans. Roy. Scot. Arb. Soc. 1906, pp. 204–5.

TABLE 13.—*Approximate value, in cents per cubic foot, of timber, 1902.*[a]

	Under 15 feet.	15 to 25 feet.	25 to 50 feet.	50 feet upward.
Oak	30	40	50	[b] 60
Ash	24	36	[b] 50	
Elm	12	18	[b] 24	
Beech	18	24	[b] 36	
Larch		18 to 28		
Scotch pine		12 to 18		
Spruce		8 to 12		
Spanish chestnut		[b] 36		
Horse-chestnut		[b] 24		
Walnut (J. regia)		[b] 50		
Lime (Tilia sp.)		[b] 36		
Hornbeam (C. betulus)		[b] 50		
Sycamore (Acer pseudoplatanus?)		[b] 36		
Willow		[b] 30		
Plane		[b] 24		
Poplar, Italian (black)		[b] 20		
Poplar, Lombardy		[b] 6		
Birch		[b] 24		
Maple		[b] 18		
Cherry		[b] 18		
Acacia		[b] 24		
Box		[b] 60		
Holly		[b] 50		

[a] From Minutes of Evidence, Departmental Committee, British Forestry, 1903, p. 171.

[b] And upward.

GERMANY.

FOREST AREA.

According to the latest figures obtained by the census of 1895, the total area now under forest in Germany is 34,989,675 acres. This forms 25.89 per cent of the total land area. The forest area is 0.62 acre per capita. The distribution of the forests in the different States in the German Empire is given in the following table:

TABLE 14.—*Area of forests of German Empire, 1900.*

States.	Total area of forests.	Land area under forest.	Area per capita.
	Acres.	*Per cent.*	*Acres.*
Prussia	20,675,335.0	23.7	0.60
East Prussia	1,611,187.5	17.4	.80
West Prussia	1,386,620.0	21.7	.88
Brandenburg	3,329,170.0	33.4	1.08
Pomerania	1,547,937.5	20.6	.95
Posen	1,432,135.0	19.8	.75
Silesia	2,904,732.5	28.8	.62
Saxony	1,339,087.5	21.2	.48
Schleswig-Holstein	315,782.5	6.7	.22
Hanover	1,651,495.0	17.2	.62
Westphalia	1,415,700.0	28.0	.45
Hesse-Nassau	1,556,665.0	39.7	.82
Rhineland	2,087,475.0	30.9	.35
Hohenzollern	97,347.5	34.1	1.45
Bavaria	6,166,385.0	32.5	1.00
Upper Bavaria	1,255,190.0	30.0	.95
Lower Bavaria	841,857.5	31.3	1.25
Pfalz	578,367.5	39.0	.70
Oberpfalz	895,660.0	37.1	1.62
Oberfranken	607,395.0	34.7	1.00
Mittelfranken	630,275.0	33.3	.78
Unterfranken	781,317.5	37.2	1.20
Swabia	576,322.5	23.5	.80
Saxony	961,350.0	25.8	.22
Wurttemberg	1,501,037.5	30.8	.70
Baden	1,419,487.5	37.7	.75
Hesse	600,022.5	31.2	.52
Mecklenburg-Schwerin	591,850.0	18.0	.98
Saxe-Weimar	232,720.0	25.8	.65
Mecklenburg-Strelitz	155,562.5	21.2	1.52
Oldenburg	170,852.5	10.6	.42
Brunswick	273,682.5	30.1	.60
Saxe-Meinigen	259,647.5	42.1	1.02
Saxe-Altenburg	89,757.5	27.1	.45
Saxe-Coburg-Gotha	148,940.0	30.1	.65
Anhalt	144,485.0	25.1	.45
Schwarzburg-Sondershausen	66,777.5	31.0	.82
Schwarzburg-Rudolstadt	103,325.0	43.9	1.10
Waldeck	106,987.5	38.2	1.85
Reuss (elder line)	28,132.5	35.6	.40
Reuss (younger line)	77,995.0	37.8	.55
Schaumburg-Lippe	17,247.5	20.3	.40
Lippe	83,720.0	27.6	.60
Lubeck	10,207.5	13.7	.10
Bremen	120.0	.2	....
Hamburg	4,467.5	4.3	....
Alsace-Lorraine	1,099,580.0	30.3	.65
German Empire	34,989,675.0	25.89	.62

Of the total area, the state forests comprise 31.9 per cent, crown forests 1.8 per cent, communal forests 16.1 per cent, institutions and associations own 3.7 per cent, and private owners 46.5 per cent. Table 15 is a detailed statement showing the forest areas according to ownership in the different States and Provinces.

TABLE 15.—*Ownership of forests of German Empire, 1900.*

State.	Crown forests.	State and shared forests.	Communal forests.	Institutional forests.	Association forests.	Private forests.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Prussia	181,052.5	6,396,172.5	2,759,115.0	244,930.0	591,072.5	10,502,992.5
East Prussia	....	958,450.0	86,122.5	12,882.5	7,525.0	546,207.5
West Prussia	107.5	839,847.5	59,497.5	3,912.5	3,142.5	480,112.5
Brandenburg	110,862.5	997,242.5	400,967.5	28,662.5	5,857.5	1,785,577.5
Pomerania	21,092.5	483,532.5	135,207.5	16,545.0	1,500.0	890,060.0
Posen	1,880.0	460,652.5	29,575.0	20,612.5	485.0	918,930.0
Silesia	41,390.0	379,660.0	228,610.0	29,200.0	1,960.0	2,223,912.5
Saxony	5,720.0	429,292.5	123,900.0	16,245.0	32,627.5	731,302.5
Schleswig-Holstein	....	90,737.5	33,807.5	4,582.5	512.5	186,142.5
Hanover	....	600,557.5	116,842.5	52,432.5	233,485.0	648,177.5
Westphalia	....	123,495.0	139,255.0	12,582.5	134,357.5	1,006,010.0
Hesse-Nassau	....	652,842.5	532,320.0	31,320.0	103,187.5	236,995.0
Rhineland	....	379,862.5	825,030.0	14,402.5	64,257.5	803,922.5
Hohenzollern	....	....	47,980.0	1,550.0	2,175.0	45,642.5
Bavaria	4,247.5	2,088,592.5	768,887.5	116,200.0	50,037.5	3,138,417.5
Upper Bavaria	170.0	480,920.0	27,147.5	18,375.0	1,007.5	727,570.0
Lower Bavaria	95.0	162,615.0	6,665.0	10,302.5	145.0	662,035.0
Pfalz	62.5	286,017.5	212,955.0	2,692.5	875.0	75,765.0
Oberpfalz	230.0	298,907.5	21,560.0	19,972.5	455.0	554,535.0
Oberfranken	200.0	234,757.5	28,077.5	8,822.5	5,790.0	329,747.5
Mittelfranken	2,060.0	200,222.5	88,005.0	10,972.5	3,412.5	325,602.5
Unterfranken	10.0	250,237.5	286,952.5	20,597.5	27,772.5	195,747.5
Swabia	1,420.0	174,915.0	97,525.0	24,465.0	10,580.0	267,415.0
Saxony	160.0	434,650.0	57,750.0	25,070.0	1,612.5	442,107.5
Wurttemberg	16,205.0	468,790.0	445,487.5	36,317.5	18,387.5	515,850.0
Baden	20,657.5	240,145.0	639,515.0	47,362.5	5,037.5	466,770.0
Hesse	166,215.0	12,302.5	217,375.0	1,690.0	5,565.0	196,875.0
Mecklenburg-Schwerin	19,107.5	248,547.5	56,662.5	29,797.5	....	237,735.0
Saxe-Weimar	125.0	110,597.5	35,562.5	3,927.5	3,212.5	79,295.0
Mecklenburg-Strelitz	3,242.5	102,692.5	12,220.0	545.0	....	36,862.5
Oldenburg	932.5	64,362.5	18,065.0	1,400.0	47.5	86,045.0
Brunswick	....	200,965.0	4,065.0	632.5	44,692.5	23,327.5
Saxe-Meiningen	260.0	110,147.5	60,807.5	1,950.0	22,985.0	63,497.5
Saxe-Altenburg	28,097.5	15,545.0	1,905.0	2,360.0	1,257.5	40,592.5
Saxe-Coburg-Gotha	8,485.0	86,807.5	18,410.0	915.0	8,910.0	25,412.5
Anhalt	49,080.0	59,557.5	2,942.5	1,760.0	207.5	30,937.5
Schwarzburg-Sondershausen	41,872.5	350.0	8,570.0	625.0	7,155.0	8,205.0
Schwarzburg-Rudolstadt	....	48,875.0	11,560.0	1,170.0	2,122.5	39,597.5
Waldeck	....	66,887.5	23,007.5	497.5	1,975.0	14,620.0
Reuss (elder line)	10,852.5	....	300.0	680.0	....	16,300.0
Reuss (younger line)	41,250.0	35.0	2,565.0	1,712.5	12.5	32,420.0
Schaumburg-Lippe	16,207.5	2,815.0	2.5	10.0	....	1,027.5
Lippe	35,205.0	7,325.0	9,142.5	312.5	1,245.0	35,000.0
Lubeck	....	....	12.5	1,362.5	....	1,507.5
Bremen	....	....	....	....	....	120.0
Hamburg	....	2,647.5	282.5	22.5	....	1,515.0
Alsace-Lorraine	....	380,897.5	491,015.0	6,285.0	....	221,382.5
German Empire	643,255.0	11,149,707.5	5,645,227.5	527,535.0	765,535.0	16,258,412.5

TABLE 15.—*Ownership of forests of German Empire, 1900*—Continued.

State.	Crown forests.	State and shared forests.	Communal forests.	Institutional forests.	Association forests.	Private forests.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Prussia	0.9	30.9	13.3	1.2	2.9	50.8
East Prussia	....	59.5	5.3	.8	.5	33.9
West Prussia	....	60.6	4.3	.3	.2	34.6
Brandenburg	3.3	30.0	12.0	.9	.2	53.6
Pomerania	1.4	31.2	8.7	1.1	.1	57.5
Posen	.1	32.2	2.1	1.4	....	64.2
Silesia	1.4	13.1	7.9	1.0	.1	76.5
Saxony	.4	32.1	9.3	1.2	2.4	54.6
Schleswig-Holstein	....	28.7	10.7	1.4	.2	59.0
Hanover	....	36.4	7.1	3.2	14.1	39.2
Westphalia	....	8.7	9.8	.9	9.5	71.1
Hesse-Nassau	....	42.0	34.2	2.0	6.6	15.2
Rhineland	....	18.2	39.5	.7	3.1	38.5
Hohenzollern	....	....	49.3	1.6	2.2	46.9
Bavaria	.1	33.8	12.5	1.9	.8	50.9
Upper Bavaria	....	38.3	2.2	1.4	.1	58.0
Lower Bavaria	....	19.3	.8	1.2	....	78.7
Pfalz	....	49.5	36.8	.4	.2	13.1
Oberpfalz	....	33.4	2.4	2.2	.1	61.9
Oberfranken	....	38.6	4.6	1.5	1.0	54.3
Mittelfranken	.3	31.8	14.0	1.7	.5	51.7
Unterfranken	....	32.0	36.7	2.6	3.6	25.1
Swabia	.2	30.4	16.9	4.3	1.8	46.4
Saxony	....	45.2	6.0	2.6	.2	46.0
Wurttemberg	1.1	31.2	29.7	2.4	1.2	34.4
Baden	1.5	16.9	45.1	3.3	.3	32.9
Hesse	27.7	2.1	36.2	.3	.9	32.8
Mecklenburg-Schwerin	3.2	42.0	9.6	5.0	....	40.2
Saxe-Weimar	....	47.5	15.3	1.7	1.4	34.1
Mecklenburg-Strelitz	2.1	66.0	7.9	.3	....	23.7
Oldenburg	.5	37.7	10.6	.8	....	50.4
Brunswick	....	73.5	1.5	.2	16.3	8.5
Saxe-Meiningen	.1	42.4	23.4	.7	8.9	24.5
Saxe-Altenburg	31.3	17.3	2.1	2.6	1.4	45.3
Saxe-Coburg-Gotha	5.7	58.3	12.4	.6	6.0	17.0
Anhalt	34.0	41.2	2.1	1.2	.1	21.4
Schwarzburg-Sondershausen	62.7	.5	12.8	1.0	10.7	12.3
Schwarzburg-Rudolstadt	....	47.3	11.2	1.1	2.1	38.3
Waldeck	....	62.5	21.5	.5	1.8	13.7
Reuss (elder line)	38.6	....	1.1	2.4	....	57.9
Reuss (younger line)	52.9	....	3.3	2.2	....	41.6
Schaumburg-Lippe	94.0	....	....	....	....	6.0
Lippe	42.0	3.4	10.9	.4	1.5	41.8
Lubeck	....	71.8	.1	13.3	....	14.8
Bremen	....	....	....	....	....	100.0
Hamburg	....	59.3	6.3	.5	....	33.9
Alsace-Lorraine	....	34.6	44.7	.6	....	20.1
German Empire	1.8	31.9	16.1	1.5	2.2	46.5

The forest area has changed comparatively little since 1878. In some parts of the Empire there has been a decrease, but in the country as a whole there has been a steady increase. The following table shows the changes mentioned:

Increase, in acres, in forest area of German Empire.

	Total wooded area.	Increase.
1878	34,682,315.0	....
1883	34,770,995.0	88,680.0
1893	34,892,067.5	121,072.5
1900	34,989,670.0	97,602.5
Total	....	307,355.0

The Government has determined the area that may be converted into forests. This potential forest area has been computed at 1,583,000 acres, or 4½ per cent of the present total forest. Of this, 1,362,500 acres are in Prussia alone, which would increase the present forest area by 6.6 per cent. Prussia is doing a great deal in bringing under forest much of its waste land. Thus from 1867 to 1892, 336,582 acres of waste land were bought at $16 per acre to plant to forest, and from 1883 to 1902, 182,782 acres were brought under forest, or an average of 9,140 acres per year. On October 1, 1903, the Prussian forest administration possessed 91,202 acres of waste land, which it intended to plant with trees.

COMPOSITION.

Of the forests, 32½ per cent are covered with hard woods and 67½ per cent with conifers. The constant tendency is to increase the latter at the expense of the former.

The following figures show the progress made in this direction:

	Hard woods.	Conifers.
	Acres.	*Acres.*
1883	12,006,450	22,764,545
1893	11,668,025	23,207,800
1900	8,862,000	23,627,673

Thus in 1883 the hard woods occupied 34½ per cent instead of 32½ per cent, and the conifers 65½ per cent instead of the present 67½ per cent. The remainder of the forest, comprising 2,699,997 acres, is a mixed composition of hard wood and conifers. In Table 16 are given detailed figures of the composition of the forest and the areas under different methods of management.

TABLE 16.—*Percentage of forest composition, by states, in Germany.*

States and provinces.	Hard woods.				
	Total.	Coppice.	Composite forest.	Selection forest.	High forest.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Prussia	30.9	7.9	2.6	3.0	17.4
East Prussia	20.3	3.1	1.3	3.4	12.5
West Prussia	11.1	2.0	.5	1.6	7.0
Brandenburg	7.3	1.2	.2	.6	5.3
Pomerania	25.6	3.2	2.4	4.4	15.6
Posen	12.5	2.1	1.5	2.0	6.9
Silesia	12.6	5.1	3.3	1.3	2.9
Saxony	27.9	3.9	5.0	4.1	14.9
Schleswig-Holstein	64.5	6.8	4.9	10.4	42.4
Hanover	36.2	3.6	4.1	3.6	24.9
Westphalia	67.2	22.2	5.1	10.2	29.7
Hesse-Nassau	65.9	8.6	1.1	1.4	54.8
Rhineland	73.5	34.3	4.8	3.5	30.9
Hohenzollern	41.0	1.3	1.0	3.4	35.3
Bavaria	24.6	4.6	7.6	1.2	11.2
Upper Bavaria	7.5	2.0	1.2	4.3	
Lower Bavaria	16.5	1.3	1.1	14.1	
Oberpfalz	3.9	.7	.6	2.6	
Oberfranken	13.5	4.0	3.4	6.1	
Mittelfranken	17.8	3.5	6.4	7.9	
Unterfranken	65.6	11.3	17.7	36.6	
Swabia	25.5	4.5	8.3	12.7	

TABLE 16.—*Percentage of forest composition, by states, in Germany*—Continued.

States and provinces.	Hard woods.				
	Total.	Coppice.	Composite forest.	Selection forest.	High forest.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Saxony	11.3	4.5	3.4	1.3	2.1
Wurttemberg	38.5	.8	12.7	1.9	23.1
Baden	50.3	8.6	10.1	.3	31.3
Hesse	58.4	10.3	.2	.1	47.8
Mecklenburg-Schwerin	36.6	9.0	2.7	1.9	23.0
Mecklenburg-Strelitz	35.8	7.6	4.5	2.1	21.6
Saxe-Weimar	35.4	3.2	9.3	4.3	18.6
Oldenburg	50.9	16.6	.5	....	33.8
Braunschweig	59.4	.5	8.1	1.0	49.8
Saxe-Meiningen	24.8	2.0	10.4	2.2	10.2
Alsace-Lorraine	66.9	6.2	22.8	.5	37.4
German Empire	32.5	6.8	5.0	2.3	18.4
1893	33.5	6.0	5.5	22.0	
1883	34.5	6.5	6.5	21.5	

States and provinces.	Conifers.						
	Total.	Selection forest.	High forest.	Pine.	Larch.	Spruce.	Fir.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Prussia	69.1	8.5	60.6	57.5	0.1	11.2	0.2
East Prussia	79.7	17.9	61.8	51.0	....	28.4	.4
West Prussia	88.9	8.2	80.7	88.0	....	.8	.1
Brandenburg	92.7	9.7	83.0	92.3	....	.4	....
Pomerania	74.4	11.2	63.2	72.0	....	.2	.1
Posen	87.5	12.0	75.5	86.9	.1	.4	.1
Silesia	87.4	8.1	79.3	71.5	.3	15.2	.4
Saxony	72.1	9.2	62.9	59.8	.1	12.1	.1
Schleswig-Holstein	35.5	5.1	30.4	15.5	.1	19.5	.3
Hanover	63.8	9.4	54.4	46.5	.2	16.9	.2
Westphalia	32.8	7.5	25.3	14.6	.3	17.6	.3
Hesse-Naussau	34.1	.9	33.2	16.6	.2	17.3	....
Rhineland	26.5	2.0	24.5	11.9	.1	14.3	.2
Hohenzollern	59.0	3.5	55.5	8.8	....	40.8	9.4
Bavaria	75.4	8.0	67.4	30.0	.1	40.5	4.8
Upper Bavaria	92.5	....	....	10.3	1.0	81.2	
Lower Bavaria	83.5	....	....	19.2	.7	63.6	
Oberpfalz	96.1	....	....	61.2	.4	34.5	
Oberfranken	86.5	....	....	39.7	.2	46.6	
Mittelfranken	82.2	....	....	53.4	.3	28.5	
Unterfranken	34.4	....	....	25.1	.8	8.5	
Swabia	74.5	....	....	3.5	.4	70.6	
Saxony	88.7	10.0	78.7	30.0	.2	58.1	.4
Wurttemberg	61.5	5.5	56.0	8.6	.1	39.9	12.9
Baden	49.7	3.2	46.5	11.6	.1	25.6	12.4
Hesse	41.6	....	41.6	34.1	.2	7.3	....
Mecklenburg-Schwerin	63.4	2.2	61.2	60.4	.1	2.5	.4
Mecklenburg-Strelitz	64.2	2.5	61.7	63.7	....	.5	....
Saxe-Weimar	64.6	4.7	59.9	39.4	.1	24.8	.3
Oldenburg	49.1	....	49.1	43.9	.2	5.0	....
Braunschweig	40.6	1.6	39.0	7.4	.1	33.1	....
Saxe-Meiningen	75.2	18.0	57.2	27.4	.5	46.8	.4
Alsace-Lorraine	33.1	.5	32.6	11.1	....	2.8	19.2
German Empire	67.5	7.4	60.1	44.6	.1	20.1	2.7
1893	66.5	....	....	41.8	.3	22.5	
1883	65.5	....	....	42.6	.3	22.6	

ANNUAL CUT.

The total cut as given for the year 1899–1900 is 1,706,223,000 cubic feet of timber, or 48.7 cubic feet per acre. The following tables give a clear idea of the annual cut for the whole Empire, as well as for the different States comprising it.

Yield of wood, 1899–1900.

	Actual amount.	Total cut.	Amount per acre.
	Cubic feet.	*Per cent.*	*Cubic feet.*
Timber (nutzholz)[a]	706,564,000	41.4	20.2
Firewood	630,032,000	36.9	17.9
Total of wood over 2¾ inches diameter (derbholz)[a]	1,336,596,000	78.3	38.1
Stump and fagot wood	369,627,000	21.7	10.6
Total production	1,706,223,000	100.0	48.7

[a] Derbholz is a general term for all wood over 2¾ inches in diameter at the small end; therefore this term will cover saw logs, mine timber, posts, poles, and also such firewood as exceeds this dimension. Nutzholz applies only to saw-log timber, in distinction from all other kinds of derbholz.

TABLE 17.—*Yield of all German forests, by states, for the year 1899–1900.*

States.	Timber.	Per cent of derbholz.	Firewood.	Per cent of derbholz.
	Cubic feet.		*Cubic feet.*	
Prussia	341,033,000	53.5	296,308,000	46.5
Bavaria	153,026,000	53.0	135,976,000	47.0
Saxony	36,818,000	75.1	12,214,000	24.9
Wurttemberg	44,972,000	55.1	36,712,000	44.9
Baden	39,889,000	48.0	43,242,000	52.0
Hesse	10,308,000	35.7	18,532,000	64.3
Mecklenburg-Schwerin	9,460,000	33.2	19,062,000	66.8
Saxe-Weimar	5,824,000	55.8	4,624,000	44.2
Mecklenburg-Strelitz	2,365,000	40.8	3,424,000	59.2
Oldenburg	1,447,000	54.7	1,200,000	45.3
Brunswick	7,272,000	49.2	7,519,000	50.8
Saxe-Meiningen	6,884,000	57.3	5,118,000	42.7
Saxe-Altenburg	3,177,000	67.7	1,518,000	32.3
Saxe-Coburg-Gotha	3,636,000	55.4	2,930,000	44.6
Anhalt	3,106,000	52.7	2,789,000	47.3
Schwarzburg-Sondershausen	1,694,000	58.5	1,200,000	41.5
Schwarzburg-Rudolstadt	2,612,000	67.3	1,271,000	32.7
Waldeck	1,024,000	33.7	2,012,000	66.3
Reuss (elder line)	812,000	74.2	282,000	25.8
Reuss (younger line)	3,459,000	82.4	741,000	17.6
Schaumburg-Lippe	494,000	63.6	282,000	36.4
Lippe	1,165,000	36.7	2,012,000	63.3
Lubeck, Bremen, and Hamburg	141,000	26.7	388,000	73.3
Alsace-Lorraine	25,946,000	45.8	30,676,000	54.2
German Empire	706,564,000	52.9	630,032,000	47.1

States.	Total yield of derbholz.	Derbholz per acre.	Stump and fagot wood.	
			Total.	Per acre.
	Cubic feet.	*Cubic feet.*	*Cubic feet.*	*Cubic feet.*
Prussia	637,341,000	30.8	225,108,000	10.9
Bavaria	289,002,000	46.9	17,085,000	2.8
Saxony	49,032,000	51.0	16,485,000	16.9
Wurttemberg	81,684,000	54.4	21,498,000	14.3
Baden	83,131,000	58.6	22,416,000	15.7
Hesse	28,840,000	48.0	13,449,000	22.5
Mecklenburg-Schwerin	28,522,000	48.1	6,460,000	10.9
Saxe-Weimar	10,448,000	44.9	3,742,000	16.0
Mecklenburg-Strelitz	5,789,000	37.3	741,000	4.8
Oldenburg	2,647,000	15.5	1,447,000	8.5
Brunswick	14,791,000	54.2	4,907,000	17.9
Saxe-Meiningen	12,002,000	46.2	4,307,000	16.7
Saxe-Altenburg	4,695,000	52.2	1,765,000	19.8
Saxe-Coburg-Gotha	6,566,000	44.1	2,436,000	16.2
Anhalt	5,895,000	40.8	2,153,000	14.8
Schwarzburg-Sondershausen	2,894,000	43.3	565,000	8.8
Schwarzburg-Rudolstadt	3,883,000	37.6	1,200,000	11.9
Waldeck	3,036,000	28.4	1,624,000	15.2
Reuss (elder line)	1,094,000	39.0	459,000	15.8
Reuss (younger line)	4,200,000	53.9	1,977,000	25.1
Schaumburg-Lippe	776,000	45.0	459,000	27.0
Lippe	3,177,000	38.0	988,000	11.7
Lubeck, Bremen, and Hamburg	529,000	35.7	459,000	30.5
Alsace-Lorraine	56,622,000	51.5	17,897,000	16.4
German Empire	1,336,596,000	38.1	369,627,000	10.6

Yield of the German forests according to ownership, 1900.

	Yield per acre.	Derbholz—		Stump and fagot wood per acre.	Yield per acre.	Timber.	Total yield—	
		Timber.	Firewood.				Split and round firewood.	Stump and fagot wood.
	Cubic feet.	*Per cent.*	*Per cent.*	*Cubic feet.*	*Cubic feet.*	*Per cent.*	*Per cent.*	*Per cent.*
Crown forests	46.9	52.0	48.0	16.7	63.6	38.4	35.4	26.2
State and state managed	48.6	57.1	42.9	9.9	58.5	47.4	35.7	16.9
Communal	37.7	43.8	56.2	15.4	53.1	31.1	40.0	28.9
Institution	47.0	51.2	48.8	13.3	60.3	39.9	38.1	22.0
Association	29.1	35.8	64.2	15.4	44.5	23.4	42.0	34.6
Private	31.1	53.1	46.9	8.8	39.9	41.3	36.6	22.1
Entailed or in trust	42.9	55.9	44.1	10.7	53.6	44.7	35.3	20.0
Other private forests	27.7	51.8	48.2	8.3	36.0	39.9	37.1	23.0

The state forests evidently yield the largest per cent of timber.

Contribution of each class of ownership to total wood production of the German Empire.

	Timber.		Firewood.		Total derbholz.		Stump and fagot wood.		Per cent of the total wood area.
	Cubic feet.	Per cent.	Cubic feet.	Per cent.	Cubic feet.	Per cent.	Cubic feet.	Per cent.	
Crown, state, and part state forests	324,313,000	45.9	246,972,000	39.2	572,063,000	42.8	121,238,000	32.8	33.7
Communal and institution	105,985,000	15.0	131,677,000	20.9	236,578,000	17.7	93,515,000	25.3	17.6
Association	7,772,000	1.1	14,491,000	2.3	22,722,000	1.7	11,828,000	3.2	2.2
Private	268,494,000	38.0	236,892,000	37.6	505,233,000	37.8	143,046,000	38.7	46.5
German Empire	706,564,000	100.0	630,032,000	100.0	1,336,596,000	100.0	369,627,000	100.0	100.0

This shows that the state forests, with only 33.7 per cent of the total forest area, produce 43 per cent of the derbholz and 46 per cent of the timber; while the private forests, with 46.5 per cent of the total area, produce only 38 per cent of derbholz and of timber.

TABLE 18.—*Timber yield of the German state forests in percentage of the total wood yield and of the yield of material over 2¾ inches in diameter.*

Year.	Prussia.		Bavaria.		Saxony.	Wurttemberg.	Baden.		Alsace-Lorraine.	Brunswick.
	Total yield.	Yield over 2¾ inches.	Total yield.	Yield, over 2¾ inches.	Yield over 2¾ inches.	Yield over 2¾ inches.	Total yield.	Yield over 2¾ inches.	Total yield.	Yield over 2¾ inches.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
1890	36	47	40	46	80	54	34	42	40	....
1891	36	46	50	55	79	51	32	39	38	....
1892	36	46	50	55	79	54	32	39	54	....
1893	36	47	37	43	78	52	32	39	39	....
1894	44	53	40	46	78	52	33	40	38	....
1895	41	51	42	48	79	53	37	44	41	52
1896	40	50	45	50	79	52	40	47	42	54
1897	43	54	46	51	80	54	41	49	43	55
1898	45	56	44	50	81	56	40	47	47	53
1899	47	60	45	51	81	57	40	48	47	50
1900	48	60	45	52	82	58	40	47	44	52
1901	48	59	42	48	80	57	38	46	39	50
1902	45	55	43	49	79	58	42	50	47	50
1903	....	....	....	....	....	....	....	....	52	....

Yield according to species.—The average yield of derbholz (wood over 2¾ inches in diameter) is greater for conifers than for the broadleaf species. The yield of the state forests in Wurttemberg per acre gives the following result:

Yield of state forests per acre.

Year.	Broadleaf species.			Conifers.		
	Total yield.	Wood over 2¾ inches diameter.	Fagot wood.	Total yield.	Wood over 2¾ inches diameter.	Fagot wood.
	Cubic feet.	*Cubic feet.*	*Per cent.*	*Cubic feet.*	*Cubic feet.*	*Per cent.*
1861–70		40.9			72.0	
1874–76	59.3	40.9	31	91.8	81.9	11
1882	60.2	40.2	33	84.6	74.0	13
1888	72.6	53.4	27	91.8	79.6	13
1895	71.9	53.1	26	85.7	74.0	15
1900	77.0	59.4	23	91.4	78.5	14
1901	78.9	60.2	24	97.4	82.9	15

Forests in coppice and compound coppice yield less than high forests; e. g., in the state forests of Baden the yield per acre for high forests from 1892 to 1896 was 79.5 cubic feet, and from 1879 to 1901, 91.2 cubic feet; for coppice and compound coppice, from 1892 to 1896, 55.1 cubic feet, and from 1897 to 1901, 65.7 cubic feet.

The German Empire, with an annual production of 48.7 cubic feet per acre, shows the highest wood production of all European countries. Of the different kinds of forests, the state and crown forests produce the greatest amount of wood per acre per year—63.6 cubic feet against 39.9 cubic feet in private forests. At the same time the state forests produce the largest percentage of saw-log timber—57.1 per cent against 53.1 per cent in private forests. Of all the States Saxony produces the largest proportion of saw-log timber. The different States may be arranged in the order of their production of saw-log timber as follows:

Distribution of saw-log timber by states.

States.	Per cent.	States.	Per cent.
Saxony	75	Brunswick	49
Saxe-Meiningen	57	Baden	48
Wurttemberg	55	Alsace-Lorraine	46
Prussia	54	Hesse	36
Bavaria	53	Mecklenburg-Schwerin	33

Although Prussia includes 59.1 per cent of the forest area of the Empire, it furnishes only 47.6 per cent of the total production of timber over 2¾ inches, and only 48.3 per cent of the timber production of the Empire; in each case less than half.

Bavaria, Wurttemberg, Baden, Alsace-Lorraine, Hesse, and Saxony, which together include 33.5 per cent of the total forest area, produce 44 per cent both of wood over 2¾ inches and of timber.

The largest percentage of saw-log timber does not necessarily mean production of the largest amount of all kinds of wood over 2¾ inches in diameter at the small end.

In the following table states with over 250,000 acres of woodland are arranged according to the production of derbholz:

Distribution of derbholz by states.

States.	Cubic feet per acre.	States.	Cubic feet per acre.
Baden	58.6	Hesse	48.0
Wurttemberg	54.4	Bavaria	46.9
Brunswick	54.2	Pfalz	44.2
Alsace-Lorraine	51.5	On the right of the Rhine	47.0
Saxony	51.0	Saxe-Meiningen	46.2
Mecklenburg-Schwerin	48.1	Prussia	30.8

ANNUAL GROWTH AND PRESENT STAND.

Since the principle underlying the management of practically all the forests is to cut merely the annual increment and to leave intact the forest capital, it may be safely assumed that the annual cut is equal to the annual growth. In some cases the annual cut has been made smaller than the annual increment, in order to increase the forest capital so as to produce larger annual increments in the future.

The total present stand is given in the "Worterbuch der Volkswirtshaft" (Prof. D. L. Elster, Jena, Achte Lieferung, 1899), at a forest rotation of eighty to one hundred years, as from 70,000,000,000, to 105,000,000,000 cubic feet. Professor Elster assumes an annual growth of 50 cubic feet per acre, which corresponds very closely with the figure given above, 48.7 cubic feet. The average rotation may be taken as ninety years, but even this is too long, since there are many broadleaf forests which do not demand such long rotations. At an annual growth of 50 cubic feet and a rotation of ninety years, the forests will have a stand of about 79,000,000,000 cubic feet[a]. At an average price even as low as 7 cents per cubic foot the German forests represent a capital of $5,530,000,000, not counting the value of the land.

ANNUAL CONSUMPTION.

In spite of the fact that the German Empire succeeds in producing the largest amount of wood per acre, it is unable to supply its own needs for saw timber. Since 1863 the imports have exceeded the exports and the difference between them has been growing steadily. In 1904 this excess in saw-log timber (logs, sawed timber, and hewn timber) amounted to 4,726,000 tons, or 357,690,300 cubic feet (1 ton being equal to about 75 cubic feet of round timber). This, together with the 1,706,223,000 cubic feet cut in Germany itself, gives a total home consumption of 2,063,913,300 cubic feet of wood of all kinds, or 36.6 cubic feet per capita. The consumption of saw-log timber alone is 1,064,322,000 cubic feet, or 18.8 cubic feet per inhabitant. The consumption of fuel alone is 999,800 cubic feet, or 17.8 cubic feet per capita.

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[a] $\text{Stand} = \text{annual increment} \times \text{area} \times \frac{\text{rotation}}{2}$

WOOD PRICES.

Tables 19 and 20 give the wood prices in the state forests in the different States. Table 20 gives the average prices of wood, irrespective of the kind and species, for a period covering seventy-four years—1830–1903. The average prices for wood of all kinds do not vary a great deal. For 1902 the prices ranged from 5 cents per cubic foot in Prussia to 10 cents in Saxony, the prevailing price being about 7 cents. Table 19 gives the average sale prices in the state forests of Prussia and Wurttemberg for saw-log timber and firewood of different species. The highest saw-log prices were secured for oak timber, and the highest firewood prices were secured for oak and beech wood.

TABLE 19.—*Prices of wood of different species and kinds in Prussia and Wurttemberg.*

Year.	Prussia.							Wurttemberg.			
	Saw-log timber.				Firewood.			Saw-log timber.		Billets and fagots.	
	Oak.	Beech.	Spruce	Pine.	Beech.	Spruce.	Pine.	Oak.	Conifers.	Beech.	Conifers.
	Price per cubic foot.				Price per cord.			Price per cubic foot.		Price per cord.	
1855–59	......	......	......	......	......	......	......	$0.131	$0.079	$4.32	$2.52
1860–64	......	......	......	......	......	......	......	.172	.106	5.67	3.60
1865–69	......	......	......	......	......	......	......	.161	.090	6.03	3.51
1870	......	......	......	......	......	......	......	.177	.083	6.75	3.15
1871	......	......	......	......	......	......	......	.158	.079	6.84	3.15
1872	......	......	......	......	......	......	......	.188	.078	5.76	3.15
1873	......	......	......	......	......	......	......	.225	.102	7.47	4.14
1874	......	......	......	......	......	......	......	.209	.121	7.56	4.86
1875	......	......	......	......	......	......	......	.200	.128	8.82	5.49
1876	......	......	......	......	......	......	......	.203	.106	9.63	5.13
1877	......	......	......	......	......	......	......	.198	.098	8.01	3.96
1878	......	......	......	......	......	......	......	.195	.102	......	......
1879	......	......	......	......	......	......	......	.171	.085	......	......
1880	......	......	......	......	......	......	......	.179	.088	......	......
1881	......	......	......	......	......	......	......	.179	.089	5.49	3.24
1882	......	......	......	......	......	......	......	.176	.088	5.31	3.15
1883	$0.137	$0.088	$0.080	$0.064	$4.05	$2.61	$2.88	.173	.092	5.40	3.60
1884	.135	.085	.078	.065	4.32	2.97	3.06	.181	.090	5.58	3.87
1885	.132	.081	.075	.064	4.32	2.79	3.33	.180	.093	5.58	3.78
1886	.126	.078	.084	.065	4.23	2.79	3.15	.179	.092	5.85	3.78
1887	.125	.078	.084	.064	4.14	2.70	2.79	.169	.086	5.40	3.06
1888	.130	.083	.093	.067	4.05	2.61	2.88	.198	.097	5.49	3.24
1889	.142	.079	.099	.071	4.14	2.43	3.06	.198	.104	5.67	3.60
1890	.143	.083	.099	.074	4.23	2.61	3.24	.223	.109	5.67	4.05
1891	.144	.077	.099	.069	4.50	2.88	3.51	.230	.097	6.03	4.32
1892	.141	.080	.088	.071	4.50	2.70	3.24	.249	.102	6.57	4.77
1893	.132	.080	.085	.069	4.32	2.52	2.97	.249	.105	6.66	4.86
1894	.128	.078	.081	.061	4.14	2.34	2.70	.251	.113	6.21	4.59
1895	.134	.078	.090	.067	4.41	2.61	2.70	.237	.116	6.75	4.95
1896	.134	.082	.097	.071	4.50	2.70	2.79	.239	.119	6.48	5.04
1897	.144	.088	.107	.076	4.59	2.79	3.15	.245	.128	6.12	5.04
1898	.146	.091	.109	.083	4.50	2.79	3.60	.253	.135	6.12	5.04
1899	.148	.087	.113	.083	4.59	2.88	4.05	.269	.143	6.30	5.04
1900	.154	.088	.113	.098	5.04	3.06	4.50	.255	.139	7.02	5.49
1901	.134	.088	.097	.086	5.31	3.24	4.14	.254	.133	8.28	6.12
1902	.139	.084	.096	.078	4.68	2.97	3.33	......	......	......	......

The figures for value per cord are about 4 per cent too high because the reducing factor 0.9 was used instead of 0.864. The figures for values per cubic foot are 4 per cent too high because the factor 0.007 was used instead of 0.006+.

TABLE 20.—*Average prices per cubic foot of wood, irrespective of kind or species, in the state forests of the different states of the German Empire.*

Year.	Prussia.	Bavaria.	Saxony.	Baden.	Alsace-Lorraine.	Year.	Prussia.	Bavaria.	Saxony.	Baden.	Alsace-Lorraine.
1830	$0.02	....	$0.04	....	....	1867	$0.04	$0.03½	$0.07	$0.06	....
1831	.02	....	.04	....	....	1868	.04½	.03½	.07½	.06	....
1832	.02	....	.04½	....	....	1869	.04	.03½	.06	.06	....
1833	.02	....	.04½	....	....	1870	.04	.04	.05½	.06½	....
1834	.02	....	.04	....	....	1871	.04	.04	.07½	.06½	....
1830–34	.02	....	.04½	....	....	1866–71	.04	.04	.07	.06	....
1835	.02½	....	.04	....	....	1872	.04	.04	.09½	.07½	$0.06½
1836	.02½	....	.04½	....	....	1873	.04½	.05	.11½	.08	.08½
1837	.02½	....	.04½	....	....	1874	.05	.05½	.11	.08½	.08
1838	.02½	....	.05	....	....	1875	.05	.05½	.11½	.09	.08
1839	.02½	....	.05	....	....	1872–75	.04½	.05	.11	.08½	.08
1835–39	.02½	....	.04½	....	....	1876	.04	.06	.08½	.08½	.08
1840	.02½	....	.05½	....	....	1877	.04	.05	.08½	.07	.06
1841	.03	....	.05½	....	....	1878	.04	.05	.08½	.07	.06½
1842	.03	....	.05½	....	....	1879	.04	.05	.08	.06½	.06½
1843	.03	....	.05½	....	....	1876–79	.04	.05½	.08½	.07½	.06½
1844	.03	....	.04	....	....	1880	.04	.05	.08½	.06½	.06½
1840–44	.03	....	.05½	....	....	1881	.04	.05	.08½	.06	.06
1845	.03	....	.05½	....	....	1882	.04	.05	.08½	.06	.06
1846	.03	....	.06	....	....	1883	.04	.05	.09½	.06½	.06
1847	.03	....	.05½	....	....	1884	.04	.05	.09½	.06½	.06
1848	.03	....	.05½	$0.03	....	1885	.04	.05	.09½	.06½	.05½
1849	.02½	....	.05½	.03	....	1886	.04	.05	.09½	.06	.05½
1845–49	.03	....	.05½	....	....	1880–86	.04	.05	.09	.06½	.06
1850	.03	$0.02	.05½	.03	....	1887	.04	.05	.09	.05½	.05
1851	.03	.02	.06	.02	....	1888	.04	.05	.09½	.06	.05½
1852	.03	.02½	.06	.02	....	1889	.04½	.05	.10	.06½	.06
1853	.03	.02	.06	.02	....	1890	.04½	.05½	.10	.06½	.06
1854	.03	.02½	.06	.04	....	1891	.05	.05½	.10	.07	.07
1855	.03	.02½	.06	.04	....	1892	.04½	.05½	.09	.07	.06½
1850–55	.03	.02½	.06	.03½	....	1893	.04½	.05	.09	.07	.06
1856	.03	.03	.06	.04	....	1894	.04½	.05½	.09	.07	.06
1857	.03	.03	.06	.05	....	1888–94	.04½	.05	.09½	.07	.06
1858	.03	.03	.07	.05½	....	1895	.04½	.05½	.09½	.07½	.07
1859	.03	.03	.07	.05½	....	1896	.04½	.05½	.10½	.07½	.07
1860	.03	.03	.07	.06	....	1897	.05	.05½	.11	.07½	.07½
1861	.03½	.03½	.07½	.06½	....	1895–97	.04½	.05½	....	.07½	.07
1862	.03½	.03½	.07½	.06	....	1898	.05½	.06	.10½	.08	.07½
1856–62	.03	.03	.07	.05½	....	1899	.06	.06½	.11	.08	.08
1863	.03½	.04	.08	.06	....	1900	.06½	.07	.11½	.08½	.08
1864	.04	.04	.08	.07	....	1901	.06	.07	.11	.08½	.08
1865	.04	.05	.09	.07½	....	1902	.05	.07	.10	.07½	.07
1863–65	.04	.04	.08½	.07	....	1903	.06	....	.11	....	.07
1866	.04	.04	.08½	.06½	....						

These are average prices obtained in the state forests, including the cost of cutting and working up the timber and delivering it along the road. They refer in Prussia and Bavaria to all kinds of wood, including stump wood, in Baden to all wood except stump wood, and in Saxony only to wood having a diameter of 2¾ inches at the small end.

FRANCE.

FOREST AREA.

The forests of France have increased to some extent since 1840, as may be seen from the following table:

Increase in forest areas, 1840–1903.

	Forest area.	Land area under forest.
	Acres.	*Per cent.*
1840	20,848,274	15.9
1862	23,026,445	17.2
1882	23,367,558	17.9
1903	24,021,587	18.2

The forest area of France is considerably smaller than that of Germany or Austria-Hungary. In 1901 the per capita forest area was 0.61 acre. The total area was distributed among different owners as follows: State forests, 2,889,470 acres, or 12 per cent; communal forests, 5,589,392 acres, or 23.3 per cent; and private forests, 15,542,725 acres, or 64.7 per cent.

Of state forests, a large part is poorly or not at all forested; the unproductive area is estimated as 662,000 acres, or nearly 23 per cent of the total area, while in the communal forests it amounts to 275,000 acres. Most of the state forests are in the departments of Ariege (203,750 acres), in the Pyrenees, Basses-Alpes (116,328 acres), Vosges (141,180 acres), Cote d'Or (100,743 acres), farther Loiret (96,582 acres), and Corsica (111,890 acres).

The most of the communal and institution forests are in the eastern departments of Vosges (296,638 acres), Haute-Saone (287,757 acres), Cote d'Or (251,815 acres), Savoie (188,098 acres), Doubs (249,600 acres), Hautes-Alpes (197,948 acres), Jura (215,333 acres,) Meuse (242,115 acres), in the more distant parts of the three departments of the Pyrenees (322,360 acres), and in Corsica (203,405 acres).

The smallest amount of private forest is found in the department of Vosges.

COMPOSITION.

Of the total area, 20 per cent is stocked with conifirs and 80 per cent with hard woods (35 per cent of this is the ordinary oak and 4 per cent is the stone oak, *Quercus ilex*). In the state forests, conifers occupy 23.4 per cent of the total area (fir 7 per cent, Scotch pine 6.6 per cent, maritime pine 4 per cent, spruce 2.7 per cent, larch 1.8 per cent, other conifers 1.3 per cent); broadleaf forests 76.6 per cent (oak 27.4 per cent, beech 18.3 per cent, hornbeam 10.9 per cent, evergreen oak, *Q. ilex,* 4 per cent, other hard woods 16 per cent). In private forests conifers form 19 per cent, hard woods 81 per cent.

According to the system of management practiced, the forests show the following proportions in state, private, and communal forests:

Distribution of forests by management.

	State forest.	Forests under state control.	Private forest.	Total forest area.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Coppice	2.5	14.7	49.0	38.0
Composite forest	29.2	53.2	31.0	35.0
Conversion forest	16.8	1.0	....	2.0
High forest	51.5	31.1	20.0	25.0

ANNUAL CUT.

The total annual cut in France amounts to 910,740,000 cubic feet, of which 225,920,000 cubic feet are timber, or a total cut of 39.39 cubic feet per acre. The cut varies in the different forests, as can be seen from the following figures:

Annual cut per acre by ownership.

	Total cut per acre of forest area.	Timber.
	Cubic feet.	*Per cent.*
State forest	43.07	35
Forests under state control	36.57	24
Private forests	40.95	25
Average	39.39	25

ANNUAL GROWTH.

While France has still much work to do before she can bring the exploitation of her forests to the point the German forests have reached, it can hardly be doubted that the present cut does not exceed the annual growth. The present yield of 910,740,000 cubic feet per year may, therefore, be considered equivalent to the total annual growth. The chief task which France has in the future is to produce a larger amount of saw-log timber in proportion to cord wood, which has a small value. The 910,740,000 cubic feet of home product are not sufficient to supply all her needs, and it is necessary to import wood for home consumption. Not counting firewood and charcoal, France has at present on an average every year a surplus of imports over exports of 44,000,000 cubic feet in round numbers. On an average, between 1894 and 1898, the following amounts of the different kinds of wood were exported and imported:

Exports and imports of wood, in cubic feet.

In form of—	Exports.	Imports.	Surplus of imports over exports.
Sawed lumber	3,277,000	74,509,000	
Logs and other round timber	43,747,000	6,721,000	
Staves	212,000	6,011,000	
Other wood, except firewood and charcoal	3,101,000	8,650,000	
Total of all kinds of wood	50,337,000	95,891,000	45,554,000

As regards firewood and charcoal, there were exported 5,129,000 cubic feet and imported 3,443,000 cubic feet; in other words, the exports exceeded the imports by 1,700,000 cubic feet, which reduces the surplus of imports over exports of all kinds of wood to 43,900,000 cubic feet.

The total home consumption, therefore, amounts to 910,740,000 plus 43,900,000 cubic feet, or a total of 954,640,000 cubic feet. The per capita consumption is 24.6 cubic feet, of which 17.7 cubic feet are firewood and 6.9 cubic feet are timber.

WOOD PRICES.

The following table gives prices for saw-log timber of different species at point of shipment along the road:

Wood prices per cubic foot, according to size of log, at points of shipping for Paris market at city gates.

SAW LOGS.

Species.	Price.
Oak, heartwood	$0.28 to $0.42
Oak, sapwood	.42 to 1.10
Beech	.25 to .34
Ash	.17 to .34
Red elm	.20 to .34
White elm	.22 to .29
Scotch pine	.13 to .18
Spruce and fir	.18 to .30

RAILWAY TIES (1905).

Contents in cubic feet.	Price per tie.
4.0	$1.08
5.4	1.45
5.7	1.54
7.2	1.94
7.6	2.04

BELGIUM.

FOREST AREA.

The present forest area of Belgium shows an increase over that of 1846, as may be seen from the following:

1846, 1,200,268.8 acres; 1866, 1,074,057.3 acres; 1880, 1,209,556.8 acres; and 1895, 1,303,735.5 acres.

The forest area forms 17.7 per cent of the total land area, or 0.2 acre per inhabitant. The most wooded provinces are Luxemburg, 41 per cent, and Namur, 31 per cent, which together comprise 666,937 acres. Of the total forest area, 62,600 acres, or 4.8 per cent, are state forests; 395,452 acres, or 30.3 per cent, are communal forests; 17,370 acres, or 1.3 per cent, belong to public institutions; and 828,314 acres, or 63.6 per cent, are private forests.

COMPOSITION.

Of the total forest area, 71.1 per cent are hard woods and 28.9 per cent are conifers (pine predominating). Of the hard woods, 56 per cent was managed as composite forest, 31 per cent as sprout forest, and 13 per cent as high forest. Especially common is oak coppice wood, managed for bark, the production of which amounts to about 29,500 tons.

ANNUAL CUT.

The annual cut is estimated as 75,789,000 cubic feet, or 58.2 cubic feet per acre, of which saw-log timber forms 40 per cent, or 28,734,200 cubic feet. In addition, some 7,415,100 cubic feet are obtained annually from trees outside of the forest, making the total cut 83,204,000 cubic feet.

ANNUAL GROWTH.

During recent years Belgium has manifested a strong tendency not only to husband her forests most rationally, but also to increase the forest area. The annual cut may, therefore, be taken as the annual growth. There are no recent figures regarding the productivity.

CONSUMPTION.

Home production is unable to satisfy the needs of the country. The consumption of mine timber alone in 1894 was 21,892,210 cubic feet and in 1903 it was 35,310,000 cubic feet. The excess of imports over exports of building timber in 1898 amounted to 36,400,126 cubic feet. The total consumption then amounts to 119,604,126 cubic feet, or 17.7 cubic feet per capita. Of this amount, 72,549,400 cubic feet, or 10.8 cubic feet per capita, consist of saw-log timber; while 47,055,000 cubic feet, or 6.9 cubic feet per capita, are cord wood.

WOOD PRICES.

The wood prices are very much the same as in Germany. The average price for all kinds, irrespective of species, is something like 6 cents per cubic foot in the forest. In Germany, as we have seen, the price of wood in the forest ranges between 5 and 8 cents, while cord wood in Prussia sells at about 3 cents.

SPAIN AND PORTUGAL.

The figures regarding the forests of Spain and Portugal are extremely conflicting; thus, according to K. van Scherzer,[a] the area of Spanish forests in 1885 was 26,098,200 acres, or 20.8 per cent of the total land area; and for Portugal, according to the same source, 1,756,000 acres, or 8 per cent of the total land area. According to A. Mélard,[b] Inspector, Department of Waters and Forests, France, the forest area in Spain may be taken as equal to 16,065,000 acres, and that of Portugal from 1,112,400 to 1,236,600 acres. Taking Mélard's figures, it would seem that the forests of Spain occupy 13 per cent of the total land area and those of Portugal 5 per cent. According to Scott Keltie,[c] the forests of Portugal amounted to only 2.9 per cent of the total land area.

The Spanish Peninsula is a plateau bordered by high mountain terraces. The rivers are unreliable, having neither glaciers nor great lakes at their sources. The rains are very unequally distributed over the different seasons. Drought is often followed by severe floods, and in order to counteract their bad effects Spain and Portugal should be well forested. Both countries, however, are lacking in this respect. As to the forest area per inhabitant, taking Mélard's figures for the areas, Spain, with a population of 18,090,000, has a forest area per capita of 0.88 acre, and Portugal, with a population of 5,423,000, has only 0.23 acre. These figures can not, however, be considered reliable, and if Spain actually has nearly 0.9 acre for every inhabitant the forest must be uncommonly poor, because Spain has not enough timber to satisfy rather low home demands for wood. The forests probably meet a great deal of the local demand and furnish large amounts of cork for export, but on the whole they are not suficient to supply the home consumption. The need for foreign timber will still further increase as soon as Spain enters on a more active exploitation of her mineral wealth.

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[a] Das wirthschaftliche Leben der Völker.

[b] Insuffisance de la production de bois d'œuvre.

[c] The Statesman's Yearbook for 1901.

There are no figures of any kind in regard to the annual cut, growth, or consumption for either country.

ITALY.

FOREST AREA.

According to Loreto Pasqualucci,[a] the forest area of Italy now comprises 11,034,900 acres, but this figure is higher than that given in the official Italian reports.[b] The official statistics[b] of this country give the area of forests as 10,115,404.2 acres, or 14.28 per cent of the total land area. The forest area per capita is 0.31 acre.

The government ownership of forests is of two kinds. One part of the state forests, 375,000 acres in extent, is under the direct control of the secretary of the treasury, and any portion of it may be sold whenever necessary; another part, much smaller in area, comprising only 40,000 acres, is declared inalienable, is directly under the secretary of agriculture, and is administered by the forest service. The largest state forest (28,245 acres) is in Tuscany, and two other large forests (one of 16,137 acres, the other of 14,840 acres) are in Venetia.

COMPOSITION.

Of the total forest area 52 per cent is managed as high forests and 48 per cent as composite and sprout forests. Of the high forest 30 per cent is coniferous, 62 per cent produces hard woods, and 8 per cent is mixed forest. The forests are thus shown to be principally hard woods.

ANNUAL CUT.

According to official statistics the following amounts were cut in all the forests: Saw-log timber, 48,525,000 cubic feet, or 4.8 cubic feet per acre; cord wood, 222,103,000 cubic feet, or 22 cubic feet per acre; and wood for charcoal, 106,621,000 cubic feet, or 10.5 cubic feet per acre, making a total of 377,249,000 cubic feet, or 37.3 cubic feet per acre.

In addition, by-products were obtained amounting to 1,708 tons; this means enormous quantities of cord wood and wood for charcoal.

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[a] Nuevo annuario del commercio dell' Italia (1895), L. Pasqualucci.

[b] Annuario statisco Italiano, 1898 ed., 1900.

ANNUAL GROWTH.

There are no figures regarding the productivity of the forests. It can not, however, be very far from the annual cut.

CONSUMPTION.

The 377,249,000 cubic feet which are cut at home are not sufficient to supply the needs of the home industries. Italy is compelled to import, though not to the same extent as England, Germany, France, and Belgium, because its industries are less developed. The average excess of imports of saw-log timber over exports, for a period of five years (1895 to 1899), was 27,023,000 cubic feet, and the yearly excess of imports of cord wood over exports for the same period was about 3,031,000 cubic feet. The total consumption of saw-log timber may therefore be taken as 75,548,000 cubic feet, or 2.4 cubic feet per capita. The total consumption of cord wood and wood for charcoal was 330,000,000 cubic feet, or 10.5 cubic feet per inhabitant. The aggregate consumption per capita is thus nearly 13 cubic feet.

WOOD PRICES.

No figures are available regarding the prices of wood.

THE NETHERLANDS.

FOREST AREA.

In the Netherlands for the last sixty-five years there has been a constant increase in the area of productive land at the expense of the noncultivated and waste land; thus, in 1833, fields, pastures, meadows, and forests occupied 63 per cent of the total land area, and the remaining 37 per cent was swamps, waste land, and roads, while in 1898, 72 per cent was under crops, forests, and gardens. In sixty-five years the Dutch have thus transformed 9 per cent of waste and unproductive land into profitable areas. Forests have also increased accordingly; in 1833 the forest area was 417,728 acres, or 5.2 per cent of the land area; in 1881 it was 552,001 acres, or 6.8 per cent of the land area; and in 1889 it was 617,567 acres, or 7.7 per cent of the land area.

The forest area in sixty-five years has increased about 50 per cent. Since the greater part is in the hands of private individuals, this increase must be taken as an indication that forestry is profitable. The per capita forest area is 0.1 acre.

COMPOSITION.

By species, the forests are distributed as follows: Two hundred and twelve thousand five hundred acres, or 37.8 per cent, are coniferous forests (pine), and 350,572 acres, or 62.2 per cent, are hard woods (chiefly oak). The sprout forest is the prevailing form of management. The oak sprout forest comprises 91,892 acres, or 16 per cent of the total forest area.

ANNUAL CUT AND GROWTH.

Unfortunately there are no reliable figures concerning the amount of annual cut. K. von Scherzer[a] estimated the cut in Holland and Belgium at 37 cubic feet per acre. Judging by the revenues obtained in the Belgian forests, the Dutch forests must yield a larger amount of wood per acre, at least 46 cubic feet. In that case the total cut would amount to 28,591,000 cubic feet. This figure may also be accepted as the annual growth, since the forests are managed for a sustained yield.

CONSUMPTION.

The annual yield is not sufficient to supply the home consumption. Holland is a highly commercial nation, but its industries are less developed than those of Belgium, and hence its wood consumption is smaller. Holland uses enormous quantities of coal and turf, and therefore does not use much wood for fuel, but it needs large quantities of timber for building purposes. The surplus average of imports of round timber over exports for five years (1895–1899) was about 24,875,000 cubic feet, and that of sawed timber for the same period, 13,757,000 cubic feet, or in all 38,632,000 cubic feet. Adding to this the annual cut at home (28,591,000 cubic feet), the total consumption in Holland would be about 67,200,000 cubic feet, or, with a population of 5,100,000, 13.1 cubic feet per capita. Even assuming that 50 per cent of the total cut is cord wood, still the consumption of cord wood would form only 2.8 cubic feet, while the consumption of timber and lumber would be 10.3 cubic feet per capita.

WOOD PRICES.

Except the general import prices per cubic foot as they are obtainable by dividing the total value of imports by their volume, no other wood prices are available. The general import price for round timber was about 14 cents per cubic foot, and that of sawed timber about 18 cents.

SWITZERLAND.

FOREST AREA.

The Swiss forests occupy 20.6 of the total land area of 10,237,560 acres, or 2,140,012 acres, while in 1884 the forest area amounted to only 1,940,465 acres. In other words, the forest area has increased 10 per cent during the last fifteen years. The Government recognizes the necessity of keeping the mountain slopes covered with forests in order to avoid landslides, and therefore extends the area under forest by all possible means, chiefly by planting. Between 1878 and 1890, 10,000,000 conifers and 1,000,000 broadleaf trees were planted on an average every year, or a total area of 4,153 acres, at a cost of $22.25 per acre. Since 1890 the planting has been done every year regularly on an increased scale. In 1899 about 14,000,000 pine seedlings, 2,000,000 spruce, 1,200,000 larch, and 1,400,000 fir and other trees were planted. The forest area per capita is 0.67 acre.

Of the total forest area, the States own 97,630 acres, or 4.6 per cent;

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[a] Das wirthschaftliche Leben der Völker.

communes and corporations, 1,431,280 acres, or 66.9 per cent; and private individuals, 611,102 acres, or 28.5 per cent. The most heavily wooded Cantons are Schaffhausen, Solothurn, Basel-Land, and Aargau; the least thickly wooded are Genève and Uri. The distribution of forests according to ownership in the different Cantons is given in Table 21.

TABLE 21.—*Distribution of forest in different cantons of Switzerland.*

Cantons.	Forest area.	Land area under forest.	State forests.	Communal and corporation forests.	Private forests.
	Acres.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Zurich	117,150.0	27.2	4.8	41.4	53.8
Bern	380,295.0	22.1	8.5	52.0	39.5
Lucern	77,355.0	20.6	1.5	19.3	79.2
Uri	27,462.5	10.2	.7	88.3	11.0
Schwiz	42,040.0	18.5		85.1	14.9
Oberalden	30,487.5	25.7	.1	92.5	7.4
Unalder	17,312.5	23.8	1.8	76.5	21.7
Glarus	26,567.5	15.4		92.6	7.4
Zug	12,922.5	21.6		73.5	26.5
Freiburg	76,875.0	18.4	10.5	48.9	40.6
Solothurn	73,010.0	36.9	3.2	76.3	20.5
Basel-Stadt	987.5	11.0		44.3	55.7
Basel-Land	36,237.5	34.2		76.9	23.1
Schaffhausen	29,055.0	39.5	16.3	70.0	13.7
Appenzell:					
Outer Rodes	14,617.5	22.4	1.5	22.5	76.0
Inner Rodes	8,310.0	20.9	1.2	34.8	64.0
St. Gallen	101,387.5	20.1	2.4	59.8	37.8
Graubunden	316,897.5	17.6	.2	89.4	10.4
Aargau	110,542.5	31.5	6.9	75.9	17.2
Thurgau	44,920.0	17.5	7.9	30.5	61.6
Tessin	151,427.5	21.5		82.3	17.7
Waadt	187,642.5	23.1	12.4	59.0	28.6
Wallis	192,652.5	14.7		94.3	5.7
Neuenburg	57,420.0	28.4	8.4	48.3	43.3
Genève	6,437.5	9.3		7.6	92.4
Average percentage		20.6	4.6	66.9	28.5

ANNUAL CUT.

Unfortunately, the latest statistics do not contain any figures for the forest cut, but the earlier statistics do contain such, and since there could not be any great change in the amount of cutting, these figures may serve our purpose.

In the early eighties the cutting in state forests, according to Professor Landolt,[a] Conservator of Forests, Zurich, amounted to 5,509,400 cubic feet, or 68 cubic feet per acre; in communal and corporation forests, 65,653,560 cubic feet, or 51 cubic feet per acre; and in private forests, 27,335,400 cubic feet, or 48 cubic feet per acre, making a total of 98,498,000 cubic feet, or an average of 51 cubic feet per acre.

Of the total cut, 40 per cent formed saw-log timber for building purposes.

ANNUAL GROWTH.

The cut of 51 cubic feet per acre, or a total of 98,498,000 cubic feet, may be taken as representing the annual growth of all the Swiss forests, since Switzerland has for a long time been practicing forestry, and became converted to the principle of cutting only the annual increment, leaving the forest capital which produces that increment.

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[a] A. Furrer. Volkswirtschafts Lexikon der Schweiz.

CONSUMPTION.

The comparatively large annual cut ought to be sufficient, apparently, for a population of about 3,000,000 inhabitants (in 1900 there were 3,117,000); but, as a matter of fact, Switzerland is compelled to import timber from abroad, and the figures for imports and exports for the fifteen years following 1885 show that the imports are constantly growing, while the exports are constantly decreasing. Timber is obtained chiefly from Germany, Austria, and France. By aid of the figures for exports and imports and the amount cut in the forests, the wood consumption, in cubic feet, for the period from 1895 to 1899 may be determined as follows:

	Saw-log timber.	Firewood.
Annual cut	40,000,000	60,000,000
Excess of imports over exports	8,500,000	8,500,000
Total	48,500,000	68,500,000

The total consumption is 117,000,000 cubic feet, or 38 cubic feet per inhabitant. Of this, 15.7 cubic feet are in the form of saw-log timber and timber for building purposes and 22.3 cubic feet in the form of firewood.

WOOD PRICES.

The stumpage prices of saw-log timber and construction timber at the place of cutting, 1895–1899, was 8.4 cents per cubic foot, and for firewood nearly 5 cents. The average price for both timber and firewood was 6.3 cents per cubic foot. These prices are practically the same as those in Prussia.

DENMARK.

FOREST AREA.

The forest area of Denmark in 1899 comprised 603,575 acres, or 6.3 per cent of the total land area, and a per capita of 0.25 acre. The islands Seeland, Bornholm, Laaland, Falster, and Fyen occupying 9.3 per cent of the total area of Denmark, contain 300,137.5 acres of forest land, or 49.7 per cent of the total forest area. The other half of the Danish forests, 303,437.5 acres, or 50.3 per cent, are found on the mainland (Jutland).

The state forests comprise 23.8 per cent, or 143,702.5 acres; of this area, 45.8 per cent is found on the Danish islands and 54.2 per cent on Jutland.

COMPOSITION.

Of the total forest area, 266,515 acres, or 44.2 per cent, are beech forests; 90,623 acres, or 15 per cent, are other hard woods; 228,625 acres, or 37.9 per cent, are coniferous forest; and 17,812 acres, or 2.9 per cent, are scrub growth.

Of the total area of state forests, 42,197 acres, or 29.3 per cent, are hardwood forests (chiefly beech); 49,917 acres, or 34.8 per cent, are coniferous forests; 41,822 acres are on barren land; and 9,767 acres, or 6.8 per cent, are not on true forest soil. The area of productive state forests is therefore only 92,114 acres. The large proportion of unproductive land in the state forests is due to the vast areas of heathland found on Jutland and the island of Bornholm. It is interesting that the coniferous forests of Denmark are all planted, the first conifers having been introduced at the end of the eighteenth century. Among these was also the silver fir (*Abies pectinata*), which is now growing on the island of Bornholm.

ANNUAL CUT, GROWTH, AND CONSUMPTION.

Unfortunately, there are no figures regarding the cut and growth or any data concerning wood consumption. Denmark fully appreciates the value of forests and treats most carefully those few which she possesses, and tries to increase the area as far as possible by planting the waste lands. Unfortunately, the area of forests is very small and the production far too little for a population of 2,300,000 inhabitants. The total productive forest area is probably not over 575,000 acres. Assuming that the forests of Denmark are producing annually as much as the forests of Holland—that is, 45 cubic feet per acre—the annual production of wood in Denmark would be 25,875,000 cubic feet. In addition to this, Denmark imports about 22,951,500 cubic feet of structural timber, or a total of 48,826,500 cubic feet. With a population of 2,465,000 the wood consumption is 19.8 cubic feet per capita.

BULGARIA.

FOREST AREA.

The agricultural statistics for 1897 credit Bulgaria with 7,169,675 acres of forests, while the forest statistics give 7,602,815 acres, or 30 per cent of the total land area. Of this, 3,505,548 acres lie within 1,200 feet of sea level, 2,483,942 acres lie between 1,200 and 3,000 feet in elevation, and 1,613,325 acres at an altitude above 3,000 feet. Only 375,000 acres of the state forests are accurately measured.

The Balkan Mountains are the most heavily wooded, especially the eastern half. Northern Bulgaria, especially the Danube region, is most sparsely wooded. In Dobrucha, along the Black Sea, dried manure is used for fuel. The forest area per capita amounts to 2.4 acres, varying from 0.2 to 10.4 acres per capita in the different provinces. The State owns 29.6 per cent, communes 51.4 per cent, and private individuals 19 per cent of the total forest area. Until 1869 the cutting of timber and grazing in the state forests were entirely free; since that year they have been brought under regulation, though not without a great deal of friction between the Government and communities.

COMPOSITION.

Hard woods—oak, beech, and, in the south, walnut—predominate. Conifers grow only in the mountains.

Bulgaria may be truly called a rural country, since five-sevenths of the total population live in villages and are engaged in agriculture. There is no rational forest management, and practically nothing is known of the condition of the forests.

SERVIA.

Data regarding Servian forests are extremely conflicting. Thus Mélard[a] gives the extent of the forests of Servia at 5,225,000 acres, or 42 per cent of the total land area. Kolm[b] gives the forest area as 4,500,000 acres, Keltie[c] as 1,202,500 acres, and Endres as 3,864,774 acres, or 32 per cent of the land area. Since the figures given by Max Endres,[d] of the University of Munich, are more recent, his estimate is undoubtedly the most reliable. The forest area per capita may be taken, then, as 1.55 acres. According to ownership the forests are divided as follows: State forests, 1,417,230 acres, or 36.6 per cent of the land area; communal forests, 1,645,650 acres, or 42.6 per cent; church and monastery forests, 42,707 acres, or 1.1 per cent; and private forests, 759,187 acres, or 19.7 per cent, making a total of 3,864,774 acres, according to Endres.

The boundaries of the different forest owners are, however, very uncertain and still disputed. The eastern part of Servia is very little wooded. Hardwoods (beech and oak) occur chiefly in the east and north, while conifers (fir, spruce, pines) are found in the west and south. On the whole, the broadleaf forests predominate. Every citizen has the right to cut timber for his own needs in the state forests; it must, however, be paid for if cut for sale. Under such a system of cutting there can hardly be any regular forest management. From the fact that in 1903 Servia had an excess of imports over exports amounting to 5,846,000 cubic feet it must be inferred either that the forests are not yet opened up or that they are already ruined by abuse, because with a forest area of 1.55 acres per capita and undeveloped industries, the forests should be fully able to supply the needs of home consumption.

No figures are available regarding the cut, yield, or consumption of wood.

GREECE.

FOREST AREA.

The forests of Greece occupy 2,023,380 acres, which is less than 13 per cent of the total land area. The forest area per inhabitant is 0.83 acre. Greece was once thickly wooded, and in ancient times had, for that period, a large merchant marine and navy. All the ships were built of wood from the neighboring mountains. Because of her large merchant marine, supplied from her forests, and the great number of warships built from the timber grown in her own forests,

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[a] Insuffisance de la production des bois d'oeuvre.

[b] Serbien; W. Kolm (Semlin, 1894).

[c] The Statesman's Yearbook; Scott Keltie (London, 1901).

[d] Handbuch der Forstpolitik; Endres (Berlin, 1905).

Greece was able to extend her commerce throughout the Mediterranean and to maintain her independence.

Now the forests are gone or are being devastated rapidly. Reckless cutting, fires, and grazing will soon complete the destruction in a country where forests are greatly needed. Nine-tenths of Greece is mountainous. The rivers have a rapid fall and resemble torrents, drying out in summer and causing floods and destruction in autumn and winter.

Information regarding forests and forestry is extremely meager. From the fact that agricultural science is not highly developed, one may safely infer that forestry is in no better condition. The chief cause of unwise use of natural resources must be sought in the lack of knowledge on the part of the people.

Although industrially undeveloped, Greece has not enough wood to provide for home consumption. Annual imports amount to 275,387 cubic feet.

TURKEY.

It is impossible to obtain figures for the forests of Turkey, but the forest situation in Turkey is no better than in Greece. There may still be some remote corners of merchantable forest, but the country as a whole must be very poor in this respect. Here, as in Greece, the ravages of man and beast are equally severe, and in the few forests remaining the destruction exceeds production.

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The countries so far considered are those whose natural resources have been more or less fully explored and whose forests yield large quantities of materials in common use, which can be delivered at a low price to market.

The forests of the rest of the world may be and are botanically rich in species, but do not have great commercial value because they lack the kinds of wood needed in commerce and industry by the 250,000,000 people composing the most advanced and powerful nations of Europe. The richest forests in Europe, commercially, are those of Sweden, and yet botanically they are very poor, containing but two principal species, Scotch pine and spruce. The forests of the regions which were not considered in the previous pages will be discussed under continents; and since our knowledge concerning those forests is, in the majority of cases, very meager, they can be treated only in a general way.

ASIA.

The forests of British East India, Japan, Siberia, and Caucasus were mentioned before. The forests of the Philippines will be taken up in connection with those of the United States.

CHINA.

The forests of China are practically unknown. Undoubtedly there must be some forests, since wood is used for building homes, etc. In Manchuria, in the three eastern provinces of the Chinese Empire, there are apparently large forests, but nothing is known of their extent. The species of economic importance in Manchuria are birch, alder, oak, maple, elm, cork tree, poplar, ash, fir, spruce, pine, and willow. The forests must be sufficient for local needs. As to the western provinces of China, they need foreign timber and receive it from the United States and Canada.

The imports are not very great as yet, but have increased considerably compared with the imports of the sixties and seventies. From the United States and Canada, China receives principally saw timber. Eventually, when the country enters upon active construction of railroads, the demand for timber will increase enormously. With 380,000,000 people, when it becomes an industrially developed country, China will be a large buyer of wood in the world's market.

PERSIA.

Persia is almost treeless. Over the largest part of it trees grow only in parks surrounding cities. Only the Caspian provinces are rich in forests of all kinds. Here, on account of the fertility of the soil, abundance of moisture in the soil, and high temperature, vegetation is extremely luxuriant and dense. The whole northern slope of the Elburz Mountains, skirting the southern shore of the Caspian, is covered with forests. In this region many species are found—elm, oak, plane tree, cherry, plum, etc.; but the most valuable tree is the box (*Buxus sempervirens*), from which is extracted a gum which is used by the people for chewing. It is considered very good for preserving the teeth and is a disinfectant. In Europe the *Buxus sempervirens* is used in engraving. This tree is now practically exterminated in all places where it was accessible, being now only found in the northwestern extremity of the Caspian region.

BRITISH POSSESSIONS IN ASIA.

CEYLON.

Next to East India, Ceylon is the most heavily wooded Asiatic possession of Great Britain. Its forest area is given as 6,762,880 acres, or 42 per cent of the total area of the island.

The number of species is very great, among which ebony and satinwood are the best known. In general the composition comes very close to that of British India; beside the species found in British India, the bamboo, eucalyptus, beech (*Fagus religiosa*), and a great number of others are found.

The local consumption of big timber is small. Although Ceylon exports rare woods, like ebony and satinwood, it needs timber for construction and has an excess of imports over exports.

The Ceylon climate is adapted to growing rubber trees, and this industry has been started on a large scale. At the close of 1900 there were 1,763 acres of all kinds of plantations.

THE FEDERATED MALAY STATES.

The total forest area of the Malay States is not known, except that the British Government has established several forest reserves with an aggregate area of 101,560 acres.

THE STRAITS SETTLEMENTS.

According to Mr. H. C. Heel, late inspector-general of the forests to the government of India, 88,320 acres, or 9 per cent of the total area of the Straits Settlements, have been declared reserved state forests. The colony exports a great deal of rubber, and the cultivation of rubber plants is a profitable enterprise.

CYPRUS.

The island of Cyprus, lying in the Mediterranean Sea off Asia Minor, is on the whole scantily wooded. An area of 448,000 acres is classed as forest, but many parts of this are of more or less open character. The most common tree is maritime pine. There are also found *Pinus laricio*, several species of oak, plane tree, alder, cedar, cypress, juniper, elm, and walnut. *Rhus coriaria* (the sumac of commerce), carob, and olive flourish.

TERRITORIES OF BRITISH NORTH BORNEO AND SARAWAK.

The total forest area of Borneo and Sarawak is not known. The territories are rich in timber and other products of the forest, as gutta-percha and india rubber. The exports of timber exceed the imports in volume.

FRENCH POSSESSIONS IN ASIA.

The forests of the Indio-Chinese possessions of France and countries under its protectorate are large, but are very little known and very little used, although they include almost the same species as are found in the forests of British India.

DUTCH POSSESSIONS IN ASIA.

Large forest areas are found in the colonies of the Netherlands, on the islands of Java and Sumatra, and part of Borneo. The forests of Java are most known. They comprise 4,920,000 acres.

AUSTRALIA AND OCEANIA.

In Australia forests in the European sense are very seldom met with, except in the form of a few thousand acres of artificial plantations. The Australian forest exists either as thicket, open forest, or chaparral growth. The tree-forest region of the mainland is almost entirely along the coast. The areas under forest in the different colonies have been estimated as follows:

TABLE 21.—*Area of forests of Australasia, by colonies.*

Colony.	Area of forests.	Land area under forest.
	Acres.	*Per cent.*
Queensland	39,680,000	9.0
New South Wales	19,840,000	10.0
Victoria	11,520,000	20.0
South Australia	3,840,000	.7
West Australia	20,480,000	3.3
Tasmania	10,880,000	65.0
New Zealand	20,480,000	31.0
Total or average	126,720,000	19.8

The distribution of forests in Australasia, as may be seen from this table, is very different in the various colonies. Thus, while in South Australia the forest does not occupy 1 per cent of the total land area, in Tasmania it forms more than half the total area.

The mainland and Tasmania are the home of the eucalypts and wattles. New Zealand, especially in the northern island, is rich in conifers, of which the Kauri pine is the most valuable. The thicket forest of Australia, especially of the east coast, has a primeval character. The open forest contains chiefly hard woods, especially the eucalypts, and the chaparral forests contain acacias.

Recently nearly all colonies have withdrawn smaller or larger areas as timber reserves, the exploitation and care of which is regulated by law. Thus, in Queensland, of the 40,000,000 acres, 1,500,000 acres have been declared timber reserves; in New South Wales, of the 20,000,000 acres of timber lands, 6,000,000 acres have been withdrawn from settlement, but not in perpetuity; in South Australia, of the 3,840,000 acres, 217,000 acres were declared reserves under the forest law of 1882, but of this area only one-fifth contains timber of commercial value, the rest being stocked with stunted trees and scrub; in addition, there are 13,000 acres planted chiefly to sugar gum, pines, American ash, and other trees; in West Australia there are 20,480,000 acres of timber lands, and more than four times as much jungle covered with small trees and scrub.

In the following statement are shown the most important trees in West Australia, the areas which they cover, and the quantity of timber standing on them:

Area and stand of timber of principal species in West Australia.

Species.	Area of forests.	Total commercial timber.	Per acre.
	Acres.	*Cubic feet.*	*Cubic feet.*
Jarrah	8,000,000	2,000,000,000	250
Karri	1,200,000	750,000,000	625
Tuart	200.000	15,000,000	75
Other species	11,000,000	350,000,000	30
Total	20,400,000	3,115,000,000	150

No timber land has been placed in reserves. Tasmania, with 11,000,000 acres of forest, equal to 65 per cent of the total area of the island, has a reservation of 266,000 acres; it is, however, subject to revocation at any time by the governor.

The forest area of New Zealand is variously estimated at from 20,000,000 acres, or 31 per cent of the total area, to only 12,000,000 acres; by an act of 1885, 1,250,000 acres were declared timber reserves. In Victoria, of the 11,520,000 acres, 5,500,000 acres have been declared reserves under the act of 1890.

Thus the colonies of Australasia possess an area of nearly 15,000,000 acres, corresponding to the state forests of Europe. A great part of this area, however, may be reopened to settlement.

There are only fragmentary figures regarding the cut in the forests of the Australian colonies. The cutting is leased under a system of royalties or licensing fees. While West Australia, Tasmania, and Queensland have an excess of exports over imports, Victoria, New

South Wales, and South Australia have an excess of imports over exports. For Australia, as a whole, the imports at present exceed the exports, and therefore it must be classed among the countries deficient in timber. The forest area of Australia ought to be sufficient to supply fully the local needs. New Zealand also, with its mild and moist climate and its great mountain chains and magnificent coniferous forests, resembling those of the Northern Hemisphere, ought to be able to supply large quantities of timber for export to her neighbors. Some statisticians, like Mélard, think that the forests of Australia have been devastated, and that a country which lives by sheep (in 1896 Australia possessed 89,745,000) can not raise at the same time both sheep and forests, as sheep require daily more extended grazing grounds at the expense of the forest. Others believe that the forests of Australia are not yet opened, and that eventually they will be fully able to supply enough good timber at least for home consumption. At present the deficit is covered by importations from the United States, Sweden, and Russia.

HAWAII.

The total area of native forests in Hawaii has recently been computed as 1,174,992 acres. In addition to this is the Algaroba forest of approximately 50,000 acres. There are established at present in Hawaii 16 forest preserves, comprising in all 444,116 acres.

The forest resources of Hawaii will be more fully discussed in connection with those of the United States.

AFRICA.

The forests of Africa are as yet very little explored. There is no doubt that in some parts of it there are to be found very valuable trees. The French and English colonies are best known.

FRENCH POSSESSIONS IN AFRICA.

ALGIERS.

In 1900 the forests of Algiers occupied an area of nearly 8,000,000 acres, a great portion of which is unproductive. The State owns 6,250,000 acres, or 77 per cent of the total; private individuals 1,250,000 acres; and communes, 192,000 acres. Forests occupy in different parts of the country from 4 to 25 per cent of the total land area.

Botanically, the Algerian forests are very rich. The principal species are cork oak (1,025,000 acres) and pine (2,000,000 acres); other species cover 470,000 acres.

TUNIS AND OTHER COLONIES.

In Tunis the forests occupy 2,027,000 acres, nearly all in the northern part of the country. Like the Algerian forests, they are greatly devastated by fires and grazing. The productive area is probably not more than 1,630,000 acres. Of this the State owns 1,158,740 acres, or 77 per cent; the rest belongs to private individuals, societies, etc.

The prevailing species is oak; cork oak occupies 290,000 acres; all other oaks, 117,500 acres.

The island of Madagascar has about 25,000,000 acres of forest, or 19 per cent of the total land area.

All other African possessions of France contain valuable species, but the extent of the forests is little known.

BRITISH POSSESSIONS IN AFRICA.

SOUTH AFRICA.

The total forest area of South Africa in May, 1905, was 640,502 acres.[a] This area includes the whole of South Africa south of the Zambesi, with the exception of Rhodesia and Portuguese East Africa, for which data are wanting. While there is forest of some economic importance in the Portuguese territory and on the Rhodesian plateau, none of the regions has any appreciable area of dense forest comparable to that of Natal, Cape Colony, and Transvaal. This forest area is distributed as follows among the different colonies: Cape Colony, 529,502 acres; Natal, excluding scrub forest, 90,000 acres (old Natal, 40,000, and Zululand, 50,000); Swaziland, 1,000 acres; and Transvaal, 20,000 acres; making a total of 640,502 acres.

Deducting from this total area the very poorly stocked cedar forests, there remains 524,408 acres of yellow wood (*Podocarpus elongata* and *P. thunbergii*), the most valuable species of South Africa. Of this amount, 23,535 acres are artificial plantations. As may be seen from these figures, Cape Colony contains the largest amount of forest, which represents not quite 0.3 per cent of the total area of the colony. The forest area per inhabitant in 1901 was 0.22 of an acre, which is not sufficient to supply the needs of the people.

Very little definite information exists in regard to the forest areas in the other British possessions in Africa, such as the west coast of Africa, the East Africa Protectorate, Uganda Protectorate, Central Africa Protectorate, the Soudan, and Mauritius, beyond the amounts of exports of rubber and gums. One thing is certain, and that is that they do not contain sufficient timber to supply their own needs.

THE SAHARA AND EQUATORIAL ZONE.

Mélard divides Africa, in accordance with the distribution of rainfall, into four zones, parallel to the equator—the Atlas and Mediterranean slopes, the Sahara, the Equatorial zone, and the South Africa zone.

The Atlas and Mediterranean slopes comprise Tunis and Algeria and the other French colonies, the forest resources of which have been discussed above. The South African zone includes the British and Portuguese possessions, the forest resources of which have also been discussed.

The Sahara, with the exception of small oases where palms are cultivated, has no forests. Egypt belongs to the Sahara zone; it has no forests, and its demand for timber is constantly increasing as a result of the growing industries and the extension of railroads.

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[a] Forests in South Africa, D. E. Hutchins, Capetown, South Africa; from Science in South Africa, August, 1905.

The Equatorial zone is supposed to contain virgin forests able to replace Canada and Sweden in the market. Mélard shows that the Equatorial forest is much less rich and extensive than has been thought. Near the Gulf of Guinea, between 10° N. and 4° S., there is a wooded area which is estimated at from 45 to 60 miles wide. East of this zone are found savannas, covered for hundreds of miles with coarse grass and scrub growth. Such is the Soudan, and the French and Belgian Kongo as far east as the upper basin of the Kongo River and its tributaries, where another large forest area is found. The Equatorial zone thus consists of two great forests, one along the western coast of Guinea and the other in the center on the upper basin of the Kongo River, divided by a vast treeless area. No definite information exists about these tropical forests of Central Africa beyond the fact that they contain many precious cabinet woods, dyewoods, etc.

Central and South America.

MEXICO.

FOREST AREA.

The area of the forests of Mexico is estimated at from 20,000,000 to 25,000,000 acres of commercially valuable timber, or 5.1 per cent of the land area. The forest area per capita is 1.8 acres. The bulk of the forests apparently belongs to the Government, which works the forests on a system of leases.

COMPOSITION.

The forests of Mexico are of two distinct kinds—the tropical forests along the coast of the Gulf of Mexico, composed of mahogany, Spanish cedar, rosewood, and other rare woods, and the pine and oak forests of the mountains, principally in the Sierra Madre on the Pacific side of the Mexican plateau.

Of these two types, the pine forest is by far the more important from the standpoint of the timber trade. These forests are very inaccessible, however, and little is known about the character of the timber, though some idea can be gained from the fact that a tract of 1,000,000 acres, recently sold, was estimated to have a stand of 8,000 board feet per acre, composed two-thirds of pine and one-third of oak. This is probably somewhat above the average for the whole area of pine forest.

The species found in the pine forests are known as white, sugar, and yellow pines, red and white firs, and many species of red and white oaks.

ANNUAL CUT, GROWTH, AND CONSUMPTION.

The forest resources of Mexico have been very little developed as yet; the pine timber is very inaccessible and the tropical hard-wood forests have been worked only to a limited extent for mahogany and cedar. Figures on the growth of the forests and the wood consumption are lacking. The annual cut of timber is given at 225,000,000 board feet of manufactured stock, or approximately 37,500,000 cubic feet of logs; and it is estimated that Mexico imports 70 per cent of its timber consumption. Assuming that this is correct, the home consumption of manufactured stock, including ties, would be 125,000,000 cubic feet, or 9 cubic feet per capita. This low consumption is due to the still undeveloped resources of the country. Whether Mexico will be able to supply its own needs of timber is questionable. At present its imports are more than three times what is cut at home. Ninety-nine per cent of all the imports come from the United States.

WOOD PRICES.

The stumpage price for pine, in the remotest and least accessible portions of the country, is as low as 75 cents per thousand feet. Standard-gauge pine ties sell at 45 cents and oak ties at 57 cents apiece delivered at the railroad. Green lumber from the saw is sold at from $17.50 to $32.50 per thousand feet b. m.

Mahogany and cedar logs shipped from Gulf of Mexico points f. o. b. New York command the following prices: Laguna cedar (*Cedrella odorata*), $45 to $60 per thousand board feet; Laguna mahogany (*Swietenia mahagoni*), $40 to $55; cedar from other points, $32.50 to $57.50; mahogany from other points, $30 to $50.

CENTRAL AMERICA.

The five Central American Republics possess extensive forest areas, which, however, are so little explored that there are no data as to their extent or volume. The reason for the existence of large forest areas in Central America is not due in any way to the care of them by the people, but to the fact chiefly that they are inaccessible on account of lack of roads or any other means of transportation.

SOUTH AMERICA.

According to Semler,[a] South America has an enormous forest wealth. With the exception of the prairies of Uruguay and Argentina, most of the continent is covered with forests. The whole chain of the Andes Mountains is wooded, the forests, according to altitude, latitude, and exposure, being of different composition. The cutting has not as yet impaired their value, because, first, the countries of South America are still very thinly settled; and second, which is more important, there are comparatively few rivers suitable for transporting timber to the coast. Not a single State has made any forest survey or has any clear idea of its forest resources.

The eastern coast of South America, south of Rio de la Plata to the Straits of Magellan, is extremely sparsely wooded. Only here and there are found a few thorny acacias, and along the rivers individual groups of willows, and occasionally antarctic beech, forms larger stands. In remarkable contrast to these are the islands of Tierra del Fuego, which, according to Darwin, are completely covered with forest.

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[a] Tropische und Nordamerikanische Waldwirtschaft und Holzkunde—Heinrich Semler, Berlin, 1888.

North of the Rio de la Plata in Uruguay one finds small forests of no commercial value along the rivers, but they supply the needs of the few people who live there.

An entirely different picture is presented in Paraguay, whose slopes toward the Parana River are covered with almost impenetrable forests. On the slopes toward the Paraguay River are the settlements; here is open grass land, and only the hills, as a rule, are wooded. According to a statement, which, however, needs confirmation, there are seventy kinds of woods which are commercially useful, two of which, lapacho and quebracho, were used by the Jesuits in constructing their missions and are still well preserved in the ruins. Fifteen kinds of trees yield dyewoods, and eight yield fibers.

The forests of Brazil cover an area equal to one-half of Europe. The Amazon flows for a distance of 1,860 miles through a virgin forest which stretches 1,100 miles from east to west and 750 miles from north to south, and occupies an area of 825,000 square miles. Many of the Brazilian woods have excellent properties. The following are among the most valuable: Pernambuco (*Cæsalpinia echinata*), fustic (*Chlorophora tinctoria*), both of which occur only near the coast; Jacaranda, ironwood (*Cæsalpinia ferrea*), and cedar (*Cedrela brasiliensis*). The forests yield other valuable products, as rubber, Brazil nuts, Paraguay tea, guarana, gums, and resins.

Guiana is relatively just as rich in forests as Brazil, especially British Guiana, which has the advantage of four large rivers which, with their tributaries, are very suitable for floating logs. For this reason the exploitation of these forests has advanced further than in any other part of the country. British Guiana furnishes two of the most valuable trees for shipbuilding—greenheart (*Nectandra rodeæi*) and mora (*Dimorphandra mora*). Greenheart is the more important, and is so hard that it nicks the axes of choppers and will last for over one hundred years in water. Dutch Guiana has a very important wood in the purpleheart (*Copaifera pubiflora* Benth.), which is suitable for the use of wheelwrights. French Guiana has a very important wood, the so-called violet wood (Bois violet—*Copaifera pubiflōra* Benth.), which is especially suited for woodworking.

Venezuela is for the most part a prairie. Its most extensive forests are found on the lower course of the Oronoco River. The home production hardly exceeds the home consumption, the only wood that is exported being *Zygophillum arborea*.

Colombia, though partially a prairie State, possesses more forests than Venezuela. The exports, however, are insignificant because of lack of transportation facilities. Ecuador and Peru are in the mountain region of the Andes, and have exceptionally luxuriant and extensive forests, which are, however, entirely inaccessible. Both of them import wood from North America.

The northern part of Chile has no forests. Forests are found only in the south, beginning at San Jago, especially in the provinces of Arauco, Valdivia, and Chiloe, but are rapidly disappearing, not on account of any great drain upon them for home consumption or export, but because the land is needed for agriculture. The forests are burned and treated by the people as an enemy, as was the case in this country at the time of the earliest colonization.

While at present South America imports some timber, it is hardly to be expected that these imports will greatly increase in the future. On the contrary, they will probably decrease, as the forests become opened up and are made more accessible.

WEST INDIES.

Semler takes a very gloomy view of forest conditions in the West Indies. He thinks that on the whole the West Indies present a sad picture of forest destruction. The small islands are robbed of their former forest wealth; and the large ones, like Jamaica, San Domingo, and Cuba, have only remnants. What little is left is almost entirely in the hands of private individuals, and nothing is done for the preservation of the forests.

John T. Rea,[a] who lived for four years in the West Indies, takes a more optimistic view of the situation, and since his observations are more recent and many of them are original they are apparently more trustworthy than Semler's. According to Rea's statement, two-thirds of most of the West Indian islands are still in virgin brush and forest, which are capable of yielding a plentiful supply of good material. Thus the Layon and Sara flats, or crown lands of Dominica, have an area of 40 square miles, and contain a mine of wealth in timber. In Trinidad, he estimates that there are at least 300,000 acres of forest land.

The total area of the West Indies is about 100,000 square miles. The trees on the whole are not very large, and yield as a rule only small scantlings. Some of the woods are useful for building and engineering work, but they are valuable principally for furniture, paneling, cabinet, and other fancy work. The immense variety of small articles, such as knife handles, knobs, buttons, etc., which are now manufactured from choice grained woods, opens a ready market for many West Indian timbers, the beauty of which can not be surpassed. Gum and resin yielding trees abound, and commercially valuable fibers may be stripped from quite a number of them. The bark, leaves, and berries of others furnish well-known drugs, dyes, and spices. Owing to the fact that all the best timber is in the inland forests with few convenient rivers for floating it down, and owing also to the defective character of the means of communication and the absence of sawmills and machinery for their treatment, the native woods have until lately been available only in small quantities. Circular and other rapid saws have been added to the plant of most of the public work yards, so that some of the disadvantages have been overcome.

Little definite information is to be had concerning the forest area of Cuba. It probably does not exceed 5,000,000 or 6,000,000 acres, which, with a population of 2,050,000, makes the area per capita about 3 acres, and constitutes about 20 per cent of the total land area. Such an area with the small local demand for wood, if the forests are properly managed and cared for, certainly ought to furnish a sufficient supply for home consumption. Unfortunately, however, the forests do not contain the kinds of timber needed for most purposes, and hence large quantities are imported annually.

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[a] The Indian Forester, Dec., 1902, p. 44a, "West Indian Timbers."

FOREST RESOURCES OF THE UNITED STATES AND HOW THEY COMPARE WITH THOSE OF OTHER COUNTRIES.

It is intended here merely to compare the most important features of the forest resources of this country with those of other countries.[a] This, perhaps, will serve at the same time as a summary of the statistical facts brought out in the preceding pages.

FOREST AREA.

The United States occupies the second place among the nations of the world as to the extent of its forests; Russia, European and Asiatic, comes first; Canada stands third.

The forests of the United States, according to ownership, may be roughly divided as follows: National forests, 100,000,000 acres of productive forest area, or 18.35 per cent; state forests, 3,000,000 acres, or 0.55 per cent; and private and unreserved public forests (unclassified), 442,000,000 acres, or 81.1 per cent.

The bulk of the forests is either in private hands or likely to pass into private ownership.

While government and state ownership of forests has invariably proved the most advantageous form, yet the proportion of forest land owned or controlled by the State can not always be taken as a criterion of the state of development of forestry in the country. The Government may, for historic or economic reasons, have only a small area of its own, but still exercise a great influence over the forests of other owners. Thus, Austria has only 10.7 per cent of the total forest area under state ownership, Switzerland 4.6 per cent, France 12 per cent, and yet forestry in those countries is at a high state of development, as all other forests are under direct control of the State, which practically amounts to management by the State.

Government and state forests comprise about 19 per cent of all forests; since the bulk of the forests is in private hands and entirely outside of state supervision, the area which is assured of a proper and careful management is comparatively small. Below is given a comparative table of forests under state ownership in the different countries of the world:

TABLE 22.—*Percentage of forests under state ownership.*

Country.	Per cent.	Country.	Per cent.
Great Britain	2.2	Norway	28.5
Italy	4.0	Bulgaria	29.6
Switzerland	4.6	German Empire	31.9
Belgium	4.8	Sweden	36.5
Portugal	8.0	Servia	36.6
Austria	10.7	Roumania	40.0
Croatia and Slavonia	11.0	Finland	61.2
France	12.0	European Russia	69.0
Hungary	15.0	Bosnia and Herzegovina	78.6
Denmark	23.8	Spain	84.0
United States (National and State)	18.9		

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[a] For forest resources of the United States see Forest Service Circular 171: The Forests of the United States: Their Use.

To supplement Table 22, it may be added that in the German Empire 66 per cent of the total forest area is under state control. In Austria, Hungary, France, Switzerland, Italy, Sweden, and Denmark the private forests are under state control; and for this reason the forest area under state supervision is much larger than the figures in the above table would indicate.

The forests of the United States form less than 29 per cent of the entire land area. The following table gives the forest area and percentage of the entire land area under forests, by States and Territories. The forest area per inhabitant is about 8 acres, corresponding closely to that in Sweden and Norway.

TABLE 23.—*Forest area of the United States, by States and Territories, 1908.*

State or Territory.	Land area. (acres).	Forest area.	
		Acres.	Percentage of land area.
Alabama	32,818,560	20,000,000	61
Arizona	72,857,600	14,000,000	19
Arkansas	33,616,000	24,200 000	72
California	99,898,880	24,000,000	24
Colorado	66,341,120	12,000,000	18
Connecticut	3,084,800	1,600,000	52
Delaware	1,257,600	350,000	28
Florida	35,111,040	20,000,000	57
Georgia	37,584,000	22,300,000	59
Idaho	53,618,560	20,000,000	37
Illinois	35,841,280	2,500,000	7
Indiana	22,966,400	4,000,000	17
Iowa	35,575,040	2,500,000	7
Kansas	52,335,360	1,000,000	2
Kentucky	27,715,840	10,000,000	39
Louisiana	29,061,760	16,500,000	57
Maine	19,132,800	14,900,000	78
Maryland	6,362,240	2,200,000	35
Massachusetts	5,144,960	2,000,000	39
Michigan	36,787,200	15,500,000	42
Minnesota	51,749,120	15,500,000	30
Mississippi	29,671,680	17,500,000	59
Missouri	43,985,280	18,300,000	42
Montana	93,296,640	18,000,000	19
Nebraska	49,157,120	800,000	2
Nevada	70,285,440	5,000,000	7
New Hampshire	5,779,840	3,500,000	61
New Jersey	4,808,960	2,000,000	42
New Mexico	78,401,920	12,000,000	15
New York	30,498,560	12,000,000	39
North Carolina	31,193,600	19,600,000	63
North Dakota	44,917,120	600,000	1
Ohio	26,073,600	4,800,000	18
Oklahoma	44,424,960	8,000,000	18
Oregon	61,188,480	27,000,000	44
Pennsylvania	28,692,480	9,200,000	32
Rhode Island	682,880	250,000	37
South Carolina	19,516,800	12,000,000	61
South Dakota	49,195,520	1,200,000	2
Tennessee	26,679,680	15,000,000	56
Texas	167,934,720	30,000,000	18
Utah	52,597,760	6,000,000	11
Vermont	5,839,360	2,500,000	43
Virginia	25,767,680	14,000,000	54
Washington	42,775,040	25,000,000	58
West Virginia	15,374,080	9,100,000	59
Wisconsin	35,363,840	16,000,000	45
Wyoming	62,460,160	10,000,000	16
Total	1,903,423,360	544,400,000	29

COMPOSITION.

The species which are most valued in international trade are the conifers, such as pine, spruce, hemlock, fir, and larch. Coniferous forests, on the whole, as German experience has shown, produce a larger percentage of structural timber than hard woods. In Germany, therefore, there is a tendency to increase the area under conifers at the expense of that under hard woods. This tendency is also often prompted by necessity. Hard woods, as a rule, require better soil than conifers, and in countries where there is need for more agricultural land to provide for an increasing population, the forests are more and more relegated to the poorer soils where conifers can be grown to better advantage than hard woods. The forest wealth of a country is therefore determined not only by the extent of the forest, but also by the species that make up the forest. As has already been pointed out, the richest forest, from a commercial standpoint, is that of Sweden, which consists chiefly of but two species, pine and spruce. In the United States, as a result of the reckless cutting of conifers, especially in the northeastern States, and of repeated fires, thousands of acres of coniferous forests in New England have been converted into poor hard-wood forests. In the Catskills one finds thousands of acres originally covered by hemlock now under scrubby hard woods, and the same is true in Maine and New Hampshire. If the soil is at all suited to hard woods, they are favored, because of their sprouting capacity, by reckless cutting and burning. Thus, while Germany has increased its area of coniferous forests, the area of hard-wood forests in this country has probably increased at the expense of the coniferous forest area. Below are given the countries and the predominance of either hard wood or coniferous forests:

Distribution of hard woods and conifers, by countries.

Hard woods predominate.	Conifers predominate.	Hard woods predominate.	Conifers predominate.
Australia and Oceania. British India. Hungary. Croatia and Slavonia. France. Japan.	Russia. Finland. Canada. United States. Sweden. Norway.	Spain. Portugal. Italy. British Isles. Holland. Denmark.	Germany. Austria. Switzerland.

It is hard to tell what proportion of the total forest area of the United States is under hard woods. From the rather conflicting estimates of the present stand of conifers and hard woods it would seem that the proportion of conifers to hard woods by volume is about 4 to 1 (on the basis of Doctor Fernow's estimate of 2,000,000,000,000 feet b. m. of both kinds, and the estimate of 400,000,000 feet b. m. of hard woods by the American Lumberman).

Of all the countries of the world the United States is the only one which has such a variety of conditions as to favor the growth of a great number of valuable species, both conifers and hard woods, over large areas.

PRESENT STAND.

The latest and best estimate of the stumpage of the United States places it at 2,500,000,000,000 feet b. m. This, however, does not represent the forest capital in the sense in which does the estimate of 944,700,000,000 board feet of the German Empire. In Germany the estimated stand is a constant quantity, a capital, which is capable of producing annually some 50 cubic feet per acre. In this country the stumpage represents a capital which is annually drawn upon, since the cut does not represent the annual growth, but exceeds it. With an annual cut of about 23,000,000,000 cubic feet of standing timber and a forest area of about 545,000,000 acres, the cut per acre is 42 cubic feet, while the annual growth on the area has been estimated at 12 cubic feet per acre.

The United States is not the only country which at present cuts more than is annually produced. The different countries may be divided according to whether they cut more than the forest produces, less, or just the same amount. In the following table are brought together the data available from the different countries of the world concerning the annual cut and the annual growth per acre.

TABLE 24.—*Annual cut and annual growth per acre, in cubic feet, for various countries.*

Country.	Annual growth.	Annual cut.
Countries which overcut.		
Austria	42.4	60–67 } 53.0
Hungary	44.4	30–33
Croatia-Slavonia	43.4	30–33
Canada	20.0	[a] 17.0
Norway	11.3	...
Roumania [b]	...	...
Spain [b]	...	...
Portugal [b]	...	...
Greece [b]	...	...
Turkey [b]	...	...
Bulgaria [b]	...	...
United States	12.0	42.0
Countries which cut just the annual growth.		
Germany	48.7	48.7
France	37.9	37.9
Switzerland	51.0	51.0
United Kingdom	45.5	45.5
Belgium	?58.2	?58.2
Holland	46.0	46.0
Denmark	...	...
Italy	37.3	37.3
Countries which cut less than the growth.		
Russia	31.0	17.0
Finland	19.8	[c] 3.44 [d] 20.00 } 13.6
Sweden	25.0	19.1
British India	...	3.0
Japan	...	35.0
Servia	...	...

[a] Plus great fire loss, estimated at 170 cubic feet per acre.
[b] No definite figures on these countries, but facts indicate that they are being overcut.
[c] State forests, 38.7 per cent.
[d] Private forests, 61.3 per cent.

While in a general way these figures indicate the annual cut and growth in the different countries, yet they do not tell the whole story. They represent the total amount of wood cut and produced, irrespective of kind.

In most of the countries where, at present, the forests are being overcut—and they are the countries which still contain virgin timber—the proportion of structural timber to firewood in the cut is much greater than will be the case in the second growth. The figures would indicate that out of 23,000,000,000 cubic feet of wood cut annually to supply the forest products, 9,000,000,000 feet (allowing 90 cubic feet per cord), or 39 per cent, is firewood. This estimate of firewood appears to be too high, but if it is correct, then the proportion of saw-log timber in the second cut will certainly be less than half of the total amount of wood produced annually, because the forests under the present system of cutting do not improve, but deteriorate in quality. This holds true not only of the United States, but of Canada, Austria, and Norway, while the reverse is true of countries like Germany and France, where the percentage of saw-log timber in gradually increasing through proper methods of management.

The cut per acre in such countries as Canada and the United States does not represent the actual cut per acre, because these figures do not always refer to the actual productive forest area, but include a great deal of unproductive lands, such as swamps, burns, etc. If the figures referred only to the productive-forest area, if that could be known, the cut per acre would be much higher.

On the whole, the figures of annual cut and growth show a sad state of affairs. Countries which with proper care for their forest resources could continue to be a source of timber supply to many other countries deficient in wood are, with few exceptions, overcutting their forests and rapidly deteriorating them. And those few countries with large forests which do not overcut the resources are deterred only through want of capital or lack of natural means of transportation, such as rivers; and still further, some other countries, though they have not enough forests to supply their own needs, continue to deplete what little they possess.

From the figures of annual growth and cut in the United States it would appear that the cut is more than three times the growth. In point of fact, however, the depletion of our forests goes on much more rapidly, owing to loss by fire on account of the lack of protection given the forests.

ANNUAL CONSUMPTION.

The consumption of wood is different in various countries, being dependent on the industrial development, on the presence of coal for fuel, and of substitutes for structural timber. In Table 25 are brought together the total annual consumption and the consumption per capita in the various countries of the world.

TABLE 25.—*Annual and per capita consumption of wood, in cubic feet, of various countries.*

Country.	Total annual consumption.	Consumption per capita.		
		Total.	Timber.	Fire-wood.
United States	23,000,000,000	260.0	160.0	100.0
Canada	1,211,209,625	192.0	60.0	132.0
Norway	276,000,000	125.0	....	....
Sweden	404,000,000	120.0	....	....
Finland	237,000,000	91.5	....	....
Russian Empire (exclusive of Finland)	6,576,280,000	63.0	25.0	38.0
Austria-Hungary	2,500,000,000	57.0	28.5	28.5
Switzerland	117,000,000	38.0	15.7	22.3
Germany	2,063,913,300	36.6	18.8	17.8
Japan	....	30.0	....	....
France	954,640,000	24.6	6.9	17.7
Denmark	48,826,500	19.8	....	....
Belgium	119,604,126	17.7	10.8	6.9
United Kingdom	670,890,000	14.0	12.8	1.2
Holland	67,200,000	13.1	10.3	2.8
Italy	405,548,000	13.0	2.5	10.5
British India	236,611,600	.8+	....	....

Thus the home consumption of the United States is larger than that of any other country in the world. While the exports amount to 2,600,000,000 feet b. m., the imports in 1907 were 1,700,000,000 feet b. m., or an excess of exports over imports of only 900,000,000 feet b. m., or 150,000,000 cubic feet, a practically insignificant amount. Therefore, the annual cut of 23,000,000,000 cubic feet may be taken as the home consumption of the United States.

WOOD PRICES.

There is a certain relationship between the wood prices of a country and the care which the forests receive. In countries with large forests and sparse population, wood prices are low and there is very little forest protection. In the following table are given wood prices on the stump for some leading European countries and for the United States:

Table 26.—*Wood prices on the stump in various countries.*

Species.	Price of structural timber per cubic foot.			
	United States, 1907.	Prussia, 1902.	Wurttemberg.	Hungary, 1901.
Oak	$0.04	$0.14	$0.25	$0.038–$0.11
Beech	.02	.084		.087
Spruce	.033	.096		
Pine	.05	.078	.13	.034– .067

Species.	Price of cord wood per cord.			
	United States, 1907.	Prussia, 1902.	Wurttemberg.	Hungary, 1901.
Oak	$1.00	$4.68		$0.60–$3.20
Beech	1.00	4.68	$8.28	1.31– 2.60
Spruce		2.97		
Pine	.75	3.33	6.12	

These figures simply give an idea of the relative value of wood in various countries. A comparison of wood prices is extremely difficult, because prices do not always include the same items. In some countries the prices include transportation to points of shipment; in others they refer to partly finished products, etc. The few figures given in the above table all refer to the price on the stump. The stumpage prices for the United States are taken from Bulletin 77, page 40, Forest Service, and 167 cubic feet are assumed to equal 1,000 board feet. The prices in the United States are mainly those in the East, and are probably higher than if western species were chosen. As it is, oak timber, probably much poorer in quality than the white oak in this country, brings in Prussia over three times as much on the stump, and in Wurttemberg over six times as much as here. The same holds true for other species, except white pine, which in New Hampshire and the Northeast is at present bringing prices approaching those obtained for Scotch pine in Prussia and Hungary. In

Wurttemberg, however, Scotch pine brings close to three times as much as white pine in this country. The prices for cord wood in European countries are also much higher than in this country. Cord wood of spruce and pine in this country are omitted, since they are used for pulp, and it would not be fair to compare them with wood used for firewood in other countries.

The difference in the wood prices here and in European countries is very great indeed, but still they do not show the actual difference in the value obtained from timber in this and other countries. These figures refer only to the used part, which is much greater in Europe than here, and therefore the difference between the stumpage value per tree obtained in this country and abroad must be still greater.

HOW FAR CAN THE UNITED STATES COUNT ON SUPPLIES FROM ABROAD?

After a discussion of the forest resources of the various countries of the world, the question naturally arises, How far, in case the resources of the United States fail, can it count on foreign sources of supply? It is obvious that there must be an increase in exports of some countries, in event of a failure of this country's timber supply, to make up the deficiency. It is equally evident that if the amount of net imports of present importing countries should increase, they would compete with the United States in case it should run short, and thus necessitate a still greater output of timber by the exporting countries.

It is important, therefore, to trace the tendencies of the timber trade of the various countries for the last few years to see what deductions can be drawn as to the future, bearing in mind their resources, as already brought out, and trying to bring out the reason why they import or export. Table 27 shows the amount of net exports or imports of the important countries of the world.

TABLE 27.—*Net exports and imports of forest products of various countries, yearly average, 1897–1901.*

Country.	Net exports.		Net imports.	
	Cubic feet.	Feet board measure.[a]	Cubic feet.	Feet board measure.[a]
Russia (with Finland)	295,000,000	2,360,000,000		
Sweden	223,000,000	1,784,000,000		
Austria-Hungary	183,500,000	1,460,000,000		
Canada	107,200,000	857,600,000		
Norway	52,000,000	416,000,000		
United States	51,000,000	408,000,000		
Roumania	3,000,000	24,000,000		
India	2,750,000	22,000,000		
West coast of Africa	1,300,000	10,400,000		
West Indies, Mexico, Central America	650,000	5,200,000		
Alaska			170,000	1,360,000
Japan[b]			250,000	2,000,000
Ceylon			500,000	4,000,000
Servia			750,000	6,000,000
Mauritius			1,000,000	8,000,000
Greece			1,750,000	14,000,000
Philippine Islands			2,000,000	16,000,000
Bulgaria			2,500,000	20,000,000
China			2,500,000	20,000,000

[a] Since the figures include lumber, logs, poles, and split wood, 1 cubic foot was regarded as equivalent to 8 board feet. In the original conversion from tons, 1 ton is regarded as equivalent to 50 cubic feet.

[b] Only construction timber included; judged by value, Japan is an exporting country

TABLE 27.—*Net exports and imports of forest products of various countries, yearly average, 1897–1901*—Continued.

Country.	Net exports.		Net imports.	
	Cubic feet.	Feet board measure.	Cubic feet.	Feet board measure.
Natal			2,500,000	20,000,000
Portugal			3,000,000	24,000,000
Cape of Good Hope			7,500,000	60,000,000
Australia			8,000,000	64,000,000
Switzerland			8,500,000	68,000,000
Holland			9,000,000	72,000,000
Egypt			10,000,000	80,000,000
Spain			10,500,000	84,000,000
South America			16,500,000	132,000,000
Italy			21,000,000	168,000,000
Denmark			23,500,000	188,000,000
Belgium			51,000,000	408,000,000
France			61,500,000	492,000,000
Germany			230,000,000	1,840,000,000
British Isles			464,500,000	3,716,000,000

The relation between forest area per capita and export or import of timber can be seen from the following table.[a]

It will be noticed that countries with 92 or more acres per 100 inhabitants have a surplus of exports over imports, while those with 85 acres or less have a surplus of imports over exports.

Relation between forest area per 100 inhabitants and exports and imports of the different countries.

Country.	Forest land per 100 inhabitants.	Excess of exports over imports.[b]	Excess of imports over exports.[c]
Exporting countries.	*Acres.*		
Canada	2,490	$26,551,000	
Finland	1,850	14,970,000	
Sweden	952	34,770,000	
Norway	762	9,585,000	
United States	620	13,450,000	
Russia (Europe)	462	23,039,000	
Bosnia-Herzegovina	405	2,632,500	
Bulgaria	230		[b] $407,000
Servia	155		[b] 148,000
Roumania	127	961,000	
Hungary	116	32,751,000	
Austria	91		
Japan	91	126,000	
Importing countries.			
Greece	85		873,000
Switzerland	66		3,653,000
German Empire	61		48,750,000
France	61		19,270,000
Italy	32		5,964,000
Denmark	25		4,817,000
Belgium	20		16,330,000
Netherlands	10		5,945,000
Great Britain	7		93,950,000

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[a] R. Zon. Forest Service Circular 159: The Future Use of Land in the United States.

[b] Average for five years, 1895–1899.

[c] Timber land largely in mountains and difficult of access. These countries will in time become exporters instead of importers.

DIVISION INTO EXPORTING AND IMPORTING COUNTRIES.

Since there are more statistics available for the countries of Europe than for others, they are first considered in detail in the order in which they occur in the following outline:

1. *Import countries.*—These may be subdivided into the four following groups, according to the reasons for their being import countries:

(*a*) Countries which, with a highly developed forest management and important forest possessions, themselves produce much wood, but in spite of this, on account of their important industries, can not do without foreign wood: German Empire, France, Switzerland, Belgium.

(*b*) Countries in which forest management plays but a small part on account of the small forest area: Great Britain, Netherlands, Denmark.

(*c*) Countries with only slightly developed forest management and little wood consumption: Italy, Spain, Portugal, Greece.

(*d*) Countries with relatively large forest areas, which, however, are in large part not yet fully developed, unequally distributed, or poorly managed: Servia, Bulgaria.

2. *Export countries.*—These are Russia (with Finland), Sweden, Norway, Austria-Hungary (with Bosnia-Herzegovina), and Roumania.

IMPORTING COUNTRIES.

EUROPE.

GERMAN EMPIRE.

Germany is unable to produce enough timber to satisfy its needs, and there is no doubt this condition will continue in the future.

Since 1863 the imports have exceeded exports, and the difference between them has been growing steadily, as shown in the two following tables.

It is worthy of note that since 1899 Austria-Hungary has taken Russia's place as the chief wood supplier of Germany. This is largely due to the greater development of the sawmill industry in Austria-Hungary, and to the fact that railroad communication is much better. Russia exports nearly all material by water.

If the average yearly import of the period 1880–1884 is taken as a standard equal to 100, then imports have increased as follows:

Increase of exports, taking the period of 1880–1884 as a standard of 100.[a]

Year average of—	Russia.	Austria-Hungary.	Sweden.	United States.	Norway.
1880–1884	100	100	100	100	100
1885–1887	129	113	134	156	109
1888–1896	166	156	244	514	111
1897–1901	201	[a] 283	358	1,950	127
1902	150	245	359	2,060	109
1903	206	285	371	2,571	111

[a] Endres, loc. cit.

Total timber imports and exports of Germany.[a]

Year average of—	Imports.		Exports.		Excess of imports.	
	Tons.[b]	Value.	Tons.	Value.	Tons.	Value.
1862-1865	1,314.000	....	1,181,000	....	133,000	....
1866-1871	1,981,000	....	897,000	....	1,084,000	....
1872-1875	3,633,000	....	1,153,000	....	2,480,000	....
1876-1878	3,190,000	$43,875,000	1,183,000	$17,500.000	2,007,000	$26,375,000
1879-1884	1,990,000	22,400,000	731,000	10,000,000	1,259,000	12,400,000
1885-1887	2,253,000	22,400,000	501,000	6,425,000	1,752,000	15,975.000
1888-1896	3,051,000	36,575,000	302,000	4,050,000	2,749,000	32,525,000
1897-1901	4,637,000	63,800,000	329,000	5,550,000	4,308,000	58.250,000
1902	3,932,000	46,400,000	342,000	5,575,000	3,590,000	40,825.000
1903	4,797,000	55,125,000	371,000	6,175,000	4,426,000	48,950,000
1904	5,049,000	59,475,000	323,000	5,825,000	4,726,000	53,650 000

[a] Endres: Handbuch der Forstpolitik.
[b] In this and the following tables 40 cubic feet is a fair equivalent for 1 ton.

Percentage of imports from most important countries which export to Germany.[a]

Year average of—	Russia.	Austria-Hungary.	Sweden.	United States.	Norway.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1880-84	46.6	37.0	7.3	0.7	2.4
1885-87	49.8	34.6	8.1	.8	2.1
1888-96	47.4	35.4	10.9	2.4	1.6
1897-1901	37.8	42.1	10.6	5.9	1.2
1902	35.3	43.0	12.5	7.4	1.2
1903	37.5	41.1	10.6	7.5	1.0

[a] Endres, loc. cit.

A glance at the above tables, with the knowledge that the forest resources of Germany are and have long been developed to their highest capacity, plainly indicates that Germany's imports will continue to rapidly increase. Her competition will be a large factor in bidding for any surplus timber in the future, and it must not be lost sight of in considering the possible sources of supply for the United States.

FRANCE.

A consideration of the following table shows that France will certainly continue to import, but the net imports are not appreciably increasing, since the population is about stationary, while the industries were already well established in 1875. The forest area is being extended, and coppice is being converted into high forest, so the imports will probably not increase to any extent for a number of years, but with growing industries they will certainly not decrease, and France will continue to be an important factor in competing for the surplus timber of the export countries.

Imports and exports of France.[a]

Year.	Imports.		Exports.		Excess of imports.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
1875		$32,820,000		$8,280,000		$24,540,000
1880		55,600,000		6,960,000		48,640,000
1885		31,780,000		5,220,000		26,560,000
1890		31,580,000		8,580,000		23,000,000
1895		26,020,000		8,880,000		17,140,000
1900	1,658,000	35,400,000	1,123,000	9,920,000	535,000	25,480,000
1901	1,667,000	35,620,000	982,000	9,580,000	685,000	26,040,000
1902	1,584,000	33,820,000	935,000	9,320,000	649,000	24,500,000
1903	1,571,000	32,560,000	1,052,000	10,840,000	519,000	21,720,000
1904		33,480,000		10,780,000		22,700,000

[a] Endres, loc. cit.

France gets most of its sawed timber from Russia, Sweden, Norway, Austria, and America.

SWITZERLAND.

The following table shows that Switzerland, with its carefully managed and productive forests, is still increasing imports yearly with the development of industries, and must be reckoned with as a competitor in future bidding for timber.

Imports and exports of Switzerland.[a]

Year.	Imports.		Exports.		Excess of imports.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
1878	180,000			$1,160,000		
1887	214,000					
1895	255,000	$2,580,000	54,000	380,000	201,000	$2,200,000
1900	273,000	3,160,000	64,000	520,000	209,000	2,640,000
1901	266,000	2,680,000	79,000	660,000	187,000	2,020,000
1902	278,000	2,840,000	77,000	640,000	201,000	2,200,000
1903	285,000	3,140,000	64,000	500,000	221,000	2,640,000

[a] Endres, loc. cit.

The percentage of firewood constitutes over half of the total import, most of which comes from southern Germany and France. The import of sawed material exceeds that of logs, and most of it comes from Austria-Hungary.

BELGIUM.

The net imports of Belgium are surprisingly large when the small area of the country is considered, and they are increasing at a rapid rate. In the future they will certainly continue to increase and help swell the demand of western Europe for wood from foreign countries.

Imports and exports of Belgium.[a]

Year.	Imports.	Exports.	Excess of imports.
1870	$4,480,000	$520,000	$3,960,000
1880	11,600,000	2,200,000	9,400,000
1890	14,080,000	2,660,000	11,420,000
1896	18,300,000	....	....
1900	26,940,000	2,980,000	23,960,000
1901	26,520,000	2,800,000	23,720,000
1902	26,860,000	660,000	26,200,000
1903	[b] 27,960,000	580,000	27,380,000

[a] Endres, loc. cit.

[b] Represents 68,835,000 cubic feet.

Sweden is the chief source of imports; then come Russia, Germany, and France.

GREAT BRITAIN.

Great Britain, on account of its scarcity of forests, its highly developed industries, and its great coal production, imports more wood than any other country in the world. The English wood consumption has an influence on the lumber trade of the whole world and also on the price of lumber; therefore the inevitable increase in it is of great interest to the United States, especially in view of the amount of imports from Canada.

Imports of Great Britain.[a]

Year.	Quantity.	Value.
	Cubic feet.	
1880	321,159,400	....
1890	360,236,500	$77,600,000
1900	496,247,400	125,484,050
1901	497,021,000	109,129,850
1902	498,718,400	122,156,950
1903	522,581,200	131,522,300
1904	458,900,000	....

[a] Endres, loc. cit.

The greatest imports are in sawed and hewn wood. Scandinavia furnishes one-third of the imports, Russia one-fourth, and America one-fifth. The export is practically nothing.

DENMARK AND NETHERLANDS.

These countries have such small areas in forest as compared with their population that imports of timber are certain to increase, as they have steadily done in the last few years.

ITALY.

The imports of Italy have slowly increased for some years, and the increase in population and development of industries will certainly more than offset any increased production of the forests, which are now mostly coppice and managed under a short rotation.

SPAIN, PORTUGAL, AND GREECE.

In spite of the fact that the industries of these countries are as yet scarcely developed, the forests can not supply the small consumption of wood. As mines and other industries are developed the imports must increase rapidly and help make the European deficit of timber much greater than at present, for the forest area per capita is extremely small.

TURKEY, BULGARIA, AND SERVIA.

These countries import timber in increasing amounts, although they are well wooded and industries are undeveloped. There is no question that their forest areas are sufficiently extensive to supply the home consumption were they under rational management and transportation facilities developed. But by the time these improvements are brought about consumption will be much greater than at present, and the wasteful methods now in force will have greatly reduced the productive power of the forests. Considering the above facts, it seems safe to predict a continuation of the timber imports for some years at least.

EXPORTING COUNTRIES.

EUROPE.

AUSTRIA-HUNGARY.

We now come to the exporting countries of Europe. Since the annual cut is greater than the annual growth, it is evident that the exports of Austria-Hungary must be reduced, for the forests are nearly all under careful management and their productivity can be increased only to a limited extent. As seen below, the exports have steadily increased and may continue to do so for some years, but not for long.

Wood export of Austria-Hungary.[a]

Year.	Exports.		Imports.		Excess of exports.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
1880	1,746,000	$17,920,000	173,000	$920,000	1,573,000	$17,000,000
1885	2,258,000	25,280,000	223,000	1,400,000	2,035,000	23,880,000
1890	2,457,000	25,080,000	210,000	1,960,000	2,247,000	23,120,000
1895	2,398,000	26,280,000	156,000	1,480,000	2,242,000	24,800,000
1900	4,237,000	51,280,000	252,000	1,800,000	3,985,000	49,480,000
1901	3,903,000	44,520,000	268,000	1,760,000	3,635,000	42,760,000
1902	3,605,000	39,720,000	237,000	1,720,000	3,368,000	38,000,000
1903	4,238,000	46,960,000	267,000	1,840,000	3,971,000	45,120,000

Year.	Exported to—				
	Germany.	Italy.	Russia.	Balkan countries.	Switzerland.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1885	33	14	6	17	2.7
1890	43	11	7	11	2.7
1895	50	18	10	10	3.1
1900	62	14	6	6	2.4
1901	60	16	9	7	2.4
1902	51	18	11	8	3.0
1903	54	17	10	....	2.9

[a] Endres, loc. cit.

RUSSIA.

The forests of Russia are capable of permanently producing much more timber than is now cut from them. In fact, the generally increasing deficit of wood in Europe must be met in large part from Russia. The following table shows how the exports of Russia have increased:

Russian exports to different countries.[a]

Year.	Tons.	Value.	Year.	Exported to—			
				England.	Germany.	Holland.	France.
				Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1885		$13,230,000	1894	50	24	9	8
1890		15,100,000	1895	46	28	8	8
1896		23,360,000	1897	40	35	10	7
1900		29,165,000	1900	41	32	12	7
1901		28,625,000	1901	43	30	12	7
1902	3,460,000	27,700,000					
1903	4,090,000	32,650,000					

[a] Endres, loc. cit.

Russia's imports are limited to the southern parts, and are mainly from Austria and Roumania. In 1901 the total imports were 756,600 tons, with a value of $4,560,000.

FINLAND.

Finland can no doubt increase her exports considerably, for the private forests cut but 0.2 of a cubic foot per acre more than the annual growth, while the 38.7 per cent of the forests which the State controls do not cut nearly so much as the growth. The following table shows the rapid development of the sawmill industry in recent years:

Development of the sawmill industry, by years.[a]

	1870.	1886.	1890.	1892.	1895.	1896.	1899.
Number of sawmills	132	245	341	376	427	464	460

[a] Endres, loc. cit.

In 1899, 248 sawmills were run by steam and 212 by water. Sixteen thousand workmen were employed.

Exports of Finland.[a]

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Cubic feet.			*Cubic feet.*	
1860		$1,920,000	1885	79,425,000	$7,880,000
1865		3,740,000	1895	122,491,000	12,200,000
1870		2,640,000	1901	164,851,000	20,300,000
1875		7,540,000	1902	168,381,000	21,620,000
1880		11,140,000	1903	211,800,000	26,200,000

[a] Endres, loc. cit.

SWEDEN.

Sweden's annual cut is less than the annual growth, and the forests may be expected to supply the home demands and allow the country to continue to increase exports to some extent. The following table shows the rate of increase in them of late years:

Exports of Sweden.[a]

Year average of—	Quantity.	Value.	Year average of—	Quantity.	Value.
	Cubic feet.			*Cubic feet.*	
1871-1875	116,490,000	$21,175,000	1897	246,750,000	$37,600,000
1876-1880	130,960,000	22,075,000	1898	236,160,000	36,600,000
1881-1885	161,670,000	24,125,000	1899	239,690,000	35,150,000
1886-1890	183,560,000	24,625,000	1900	245,690,000	38,450,000
1891-1895	210,040,000	28,275,000	1901	219,920,000	32,975,000
1896	235,800,000	32,975,000	1903	243,570,000	....

[a] Endres, loc. cit.

Great Britain takes about half of the Swedish exports, then come France, Denmark, Germany, Netherlands, Cape Colony, Australia, and South America. Planed boards go chiefly to Netherlands, Cape Colony, England, and Australia.

The large number of floatable streams in Sweden have been important factors in enabling it to take one of the foremost places in the world's timber market. The wood industry has been intensively developed. In 1898 there were 1,030 saw and planing mills, which employed 40,700 workmen; in addition there were 501 other woodworking establishments, with 22,300 workmen; as motive power, 507 turbines, 706 steam engines, and 178 electric motors were used.

NORWAY.

The forests of Norway are now being overcut, so that the exports, which have not increased much since 1870, will evidently decrease in the future.

Exports of Norway, by amounts and values.[a]

Year.	Quantity.	Value.
	Cubic feet.	
1870	67,211,000	....
1876-1880	63,964,000	....
1886-1890	65,517,000	$7,875,000
1895	59,128,000	6,900,000
1900	70,671,000	10,675,000
1901	63,717,000	8,900,000
1902	69,259,000	9,575,000
1903	75,260,000	11,125,000
1904	63,434,000	9,075,000

[a] Endres, loc. cit.

Exports of wood-pulp material are also very important, and in 1904 reached a value of $7,500,000.

The exports were distributed as follows:

Distribution of timber exports of Norway.[a]

Year.	South Africa.	Great Britain.	Belgium.	Netherlands.	France.	Germany.	Denmark.	Australia.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1881	....	64.0	2.8	10.0	10.0	4.5	4.3	....
1887	2.0	63.4	7.2	6.6	8.6	4.3	2.1	3.3
1898	2.5	57.0	9.0	9.0	5.0	5.0	....	7.0
1900	2.1	63.0	8.4	6.1	4.9	4.5	1.9	5.9
1901	3.0	63.0	7.4	4.9	5.5	3.9	1.7	6.6

[a] Endres, loc. cit.

Small amounts of timber go to Sweden, Iceland, Spain, and Brazil.

ROUMANIA.

Satisfactory data as to the cut and growth of forests in Romania can not be had, but the forest area per capita is too small to expect much increase in export in the future, although of late years it has grown rapidly, as transportation developed.

SUMMARY FOR EUROPE.

The following table shows the great increase in the export timber trade of the world's leading export countries.

Value of export timber trade of leading export countries.[a]

Country.	Average of years—					
	1881–1890.	1891–1895.	1896–1900.	1901.	1902.	1903.
Sweden	$27,100,000	$31,450,000	$40,675,000	$37,250,000	$38,750,000	$41,500,000
Norway	9,350,000	7,850,000	11,325,000	10,000,000	10,750,000	14,000,000
Finland	8,700,000	10,175,000	17,500,000	20,300,000	21,625,000	26,250,000
Russia	16,925,000	22,700,000	29,250,000	30,900,000	29,925,000	35,250,000
Austria-Hungary	23,875,000	25,800,000	42,500,000	47,300,000	42,200,000	49,900,000
United States	21,375,000	21,250,000	40,300,000	41,375,000	52,075,000	51,550,000
Canada	23,000,000	23,450,000	27,825,000	29,850,000	33,500,000	31,400,000
Total	130,325,000	142,675,000	209,375,000	216,975,000	228,825,000	249,850,000

[a] Endres, loc. cit.

In 1903 the total import of Europe was 1,164,900,000 cubic feet,[a] and the total export 1,023,700,000 cubic feet, showing an excess import of 141,200,000 cubic feet.

This balance is made up chiefly from Canada and the United States. A brief summary of Europe leads to the following conclusions:

1. The leading import countries, Great Britain, Germany, France, Belgium, Switzerland, etc., are rapidly increasing the amount of their imports, and this increase is certain to continue.

2. Russia, Finland, and Sweden only of the export countries can increase to any great extent their export without reducing their timber capital.

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[a] Endres, loc. cit.

3. Norway and Austria-Hungary are already overcutting, and will in all probability have to reduce their exports in the future.

In view of these facts, with the rising prices of timber, it is certain that any increased exports from Russia, Finland, and Sweden will be eagerly competed for by Great Britain, France, Germany, etc., and there will be no surplus of any consequence for the United States, handicapped as it is by greater distance, and hence greater cost for transportation. Hence in case of a failure of our timber resources, we must look to other than the European countries for a source of supply.

AFRICA.

EGYPT.

Egypt has no forests in the true sense of the word, but is interesting as a buyer. The industrial development and railroad building which the last few years have seen in Egypt, and which give every sign of continuing, will certainly result in increased demand for timber. The following table shows the important increase of it in late years.

Imports of Egypt.[a]

Year average.	Structural timber.	Firewood.	
		Quantity.	Value.
		Cubic feet.	
1885–1889	$1,547,000	....	....
1890–1894	2,161,500	3,187,000	$220,000
1895	2,481,500	2,355,000	136,000
1896	2,122,000		
1897	2,505,500		
1898	3,170,500		
1899	3,213,500		

[a] From A. A. Radzig, [Forests and Forestry in Various Countries, a Statistical Investigation]. St. Petersburg, 1902.

SOUTH AFRICA.

The forests of South Africa are entirely inadequate to supply home needs, and the imports are certain to continue to increase with the population and industrial development.

Imports of Cape Colony and Natal.[a]

Year.	Cape Colony.	Natal.
1890–1895	$575,500	$417,000
1895–1899	859,000	876,000

From A. A. Radzig, loc. cit.

These imports amount to 5,000,000 cubic feet, the annual average for the years 1895–1899. The following countries sent in 1895 to South Africa the amounts shown on page 84.

Exports to South Africa.

Country.	Quantity.	Country.	Quantity.
	Cubic feet.		*Cubic feet.*
Sweden	2,465,777	India and Burma	56,679
Norway	1,041,327	New Zealand	32,548
United States	1,020,144	South Africa	1,592
Great Britain	185,121		

CENTRAL AFRICA.

The forests of Central Africa are little known, but their area is not so great as commonly supposed, and the chief species of commercial value are expensive hard woods, which have no bearing on the question of the supply of common timber for the United States.

NORTH AFRICA.

The countries of North Africa, other than Egypt, have barely sufficient forest for the low home consumption, except Algeria, which has already had to import timber. With increased railroad building and general development this import will increase.

Imports of Algeria.

Year average.	Value.
1890–1894	$813,500
1895–1899	814,000

A review of Africa shows, then, a timber import destined to increase in the future in all but the central part, which is utterly undeveloped and can export only costly woods.

ASIA (EXCLUSIVE OF SIBERIA).

CHINA.

The reasons why China will continue to import in rapidly increasing amounts have been fully brought out; that it will take the surplus of eastern Siberia and continue to draw on the United States and Canada is certain.

Imports of structural timber of China.

Year average.	Value.	Year average.	Value.
1867–1870	$261,500	1885–1889	$744,000
1871–1875	440,500	1890–1894	1,074,500
1876–1879	616,500	1895–1899	1,201,000
1880–1884	592,000		

PERSIA.

The forests of Persia are limited in extent and do not produce woods of common use to an extent to supply any timber for export.

CEYLON, STRAITS SETTLEMENTS, INDO-CHINA, ETC.

These minor countries of Asia are too little known and their forests are too little explored to give any basis for definite predictions. However, it may be said in a general way that they will not develop sufficiently for many years to import much structural timber and their exports are solely of valuable woods which are not important in this discussion.

BRITISH INDIA.

The exports of India consist of teak and other valuable woods, and it is found necessary to import structural timber. Thus India, while an export country from the point of view of value, is an import country if only common woods be considered, and will no doubt so continue, for any greater supply made available by better transportation facilities will be offset by greater consumption, following development of industries. The following table gives the exports of India for 1903–4, and shows the kind of forest products exported.

Exports of India, 1903–4.[a]

Material.	Quantity.	Value.
	Tons.	
Caoutchouc	90	$115,732
Lac	11,781	9,079,320
Sandal, ebony, and other ornamental woods	....	403,163
Cutch and gambier	5,652	657,904
Myrobolans	61,480	1,403,429
Teak timber	73,913	3,048,536
Cardamoms	128	112,538
Total	....	4,820,622

[a] Schlich, Forest Policy.

JAPAN.

Conflicting figures are given by different statisticians on the timber trade of Japan, according to how much they include under timber. If only structural timber is considered, Japan is an importing country by a small margin, while if all woods be considered it is an exporting country. Japan can supply home needs when all the forests are accessible, but will probably not be able to export any saw-log timber. Certainly this country can not look for any supplies from Japan, for any surplus will in all probability go to Manchuria, since the shorter distance and Japan's interest in developing that country would enable it to outbid the United States. The following table gives the exports and imports of wood and wood products, except match wood, in recent years.

Value of exports and imports of Japan.[a]

	1892.	1896.	1900.	1901.	1902.	1903.	1904.
Export	$135,000	$460,000	$980,000	$655,000	$660,000	$980,000	$1,335,000
Import	40,000	145,000	450,000	355,000	380,000	335,000	255,000
Net exports	95,000	315,000	530,000	300,000	280,000	645,000	1,080,000

[a] Endres, loc. cit.

AUSTRALASIA.

There is a difference of opinion as to whether poor condition resulting from abuse or inaccessibility is the cause of the insufficiency of Australasia's forests to supply home needs at present. In any case, the imports are sure to continue to increase for some years, and it is very unlikely that any surplus timber for export will ever be produced. The following table gives the net exports or imports of each of the colonies for the period 1894–1899:

Value of net exports and imports by colonies.[a]

	Net exports.		Net imports.
Western Australia	$789,500	Victoria	$1,364,000
New Zealand	758,500	New South Wales	1,344,000
Tasmania	154,500	South Australia	1,003,500
Queensland	29,000		
		Total	3,711,500
Total	1,731,500	Total net exports	1,731,500
Net imports of all Australasia			1,980,000

[a] From A. A. Radzig, loc. cit.

HAWAII.

Hawaii, with only about 1,175,000 acres of forest, and developing industries, can export only a trifling amount of timber.

THE PHILIPPINES.

The Philippine Islands contain about 49,000,000 acres of wooded land, and the estimate per acre given is 2,500 board feet, which gives a total of 122,500,000,000 board feet of merchantable timber. The Philippines import timber for two reasons—the inaccessibility of their own forests at present, and the need of light, easily worked wood. In time, as transportation is developed and the forests are made accessible, the native forests should supply nearly all the home consumption, and leave enough over for export to equal or surpass the quantity imported of certain classes of timber which are not found in the islands. But owing to the small amount of total stand, and the fact that there are only about 2 acres per capita in commercial forest, the increase in consumption with development of industries and increase in population will prevent the timber export from ever being an important factor in supplying the United States.

SUMMARY FOR ASIA.

A brief summary of Asia results in the following conclusions: (1) China and Australasia are import countries; the imports of the former will increase rapidly, while Australasia will probably not increase the amount of her import much; (2) Japan and India export valuable woods and import structural timber; (3) these countries will be buyers of saw-log timber, and can not be counted on as possible sources of supply for the United States, but must be regarded rather as possible competitors; (4) the Philippines, though now an importing country, should be able to export sufficient timber, when the wood industry is developed, to offset the imports.

TROPICAL AND SOUTH AMERICA.

MEXICO, WEST INDIES, AND CENTRAL AMERICA.

These States now import timber not so much because they have none, but for the reason that it is at present inaccessible. Whether forest exploitation will develop as rapidly as other industries and the amount of imports remain stationary or be reduced or whether they will increase can not be safely predicted. It would seem that there will always be an export of mahogany, cedar, and other valuable woods, and it is most probable that there will continue to be an import of common woods.

SOUTH AMERICA.

For many years South America will continue to export hard woods, dyewoods, etc., and import lumber and construction material. Eventually, as the countries develop, the great forests now inaccessible will be opened up, and should supply home consumption, which will have increased greatly by that time. The imports will no doubt not increase to any serious extent, but are more likely to diminish. At the same time, the exports can not be counted on as a source of supply for this country for the reason above stated—that by the time the forests are accessible the country will have developed so much that home consumption will have greatly increased, and also because the forests are so situated that logging and transportation will be so costly as to prohibit the use of the wood for construction in this country.

NORTH AMERICA.

ALASKA.

Alaska has approximately 107,000,000 acres of forest land, of which 37,000,000 acres, situated along the south coast and the river valleys, bear relatively heavy forests of valuable species, while the remaining 70,000,000 occupy the interior to the limit of tree growth. The interior forest consists for the most part of scattered stands, and only from 50 to 75 per cent of it can be said to be actually forested. Estimating these stands to run 500 board feet to the acre, the interior forest contains not over 21,000,000,000 feet, board measure. This timber runs small and knotty, and is insufficient to supply the needs of the mining population, largely because much of it is inaccessible with the present means of transportation. With the increasing development of mines it is safe to assume that this interior forest will continue to be needed for local consumption and may fall short of supplying it. The forests of the south coast and of the river valleys, on the other hand, are often dense and the trees large. Toward the north the trees fall off in size and the forest gradually assumes the character of the northern forest. Estimating the average stand per acre, at 2,000 feet, the total stand for this forest amounts to 75,000,000,000 feet, board measure, not quite twice the annual lumber cut of the United States. In this part of Alaska fisheries and oil developing are the principal industries, so that the home consumption of timber is not so great, and in all probability this region may in the future, when transportation is developed, be able to export timber to the United States. However, owing to the relatively small amount of forest, it can contribute but a very small part of the timber used by this country.

CANADA.

The Canadian forests are being cut and burned faster than they are growing, as already shown, and yet the exports are growing steadily, as shown below:

Yearly average and values of exports of Canada.[a]

1881–1890	$23,000,000
1891–1895	23,450,000
1896–1900	27,825,000
1901	29,850,000
1902	33,500,000
1903	31,400,000

In 1904 the value of wood imported was $9,000,000.

It is evident, then, that Canada, the only country which the United States can now count on for any considerable amount of timber, will not long remain a source of supply to the United States.

CONCLUSION.

The review of the timber trade of the various countries of the world shows a steady increase in wood consumption and imports of nearly all the leading import countries, and but three important countries, Russia, Finland, and Sweden, which can increase their export without lessening their forest capital. This increase will be needed in western Europe to make up the growing deficit there, and will not be a source of supply for the United States. Thus the tendency is toward a greater overcutting of timber on the part of the export countries, to make up the increasing deficit of the import countries, which policy, if continued, would lead to a universal shortage, with no surplus to draw upon. This picture, gloomy as it may seem, is offset by the birth of a new economic force—the general appreciation of the value of forests and the movement toward the introduction of rational forest management by all civilized peoples. There is no doubt whatever that there is enough accessible actual and potential forest land in civilized countries to produce, under proper management, an abundance of timber to supply indefinitely the world's growing demand.

Doctor Schlich states, in his Forest Policy, that by planting up waste lands in Great Britain much of the annual import could be replaced by home-grown timber. If any material results can be expected in Great Britain, this country, with its great existing forests and large amount of permanent forest land, can certainly supply its timber needs. Not only of necessity, in view of the lack of any adequate foreign source of supply, but also from national pride and the desire to preserve a tremendous native industry, the United

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[a] Endres, loc. cit.

States should introduce rational forest management. At present, forest management would consist in large part of conservative treatment of existing forests with a relatively small amount of planting. If postponed until a timber shortage forces the United States to action, it would face the problem of the slow conversion of scrubby woodland into productive forest and the costly planting of denuded wastes on a very large scale. While the present area of wooded land in the United States is usually estimated as 545,000,000 acres, some of this is of no commercial value, and much is inevitably destined, with the increase in the population of the country, to be cleared for agriculture. The area of land so situated as to be permanent forest land is about 450,000,000 acres, of which 100,000,000 will consist of farm woodlots. The inevitable increase in wood consumption, following increase in population and growth of industries, will thus have to be supplied from a diminished forest area. Therefore, the only solution of the problem of a wood supply is to begin now to prepare for making a diminished forest area supply an increased population. This means that the land should be surveyed and classified by the Government, and forest management applied to the permanent forest land now—before it is too late.

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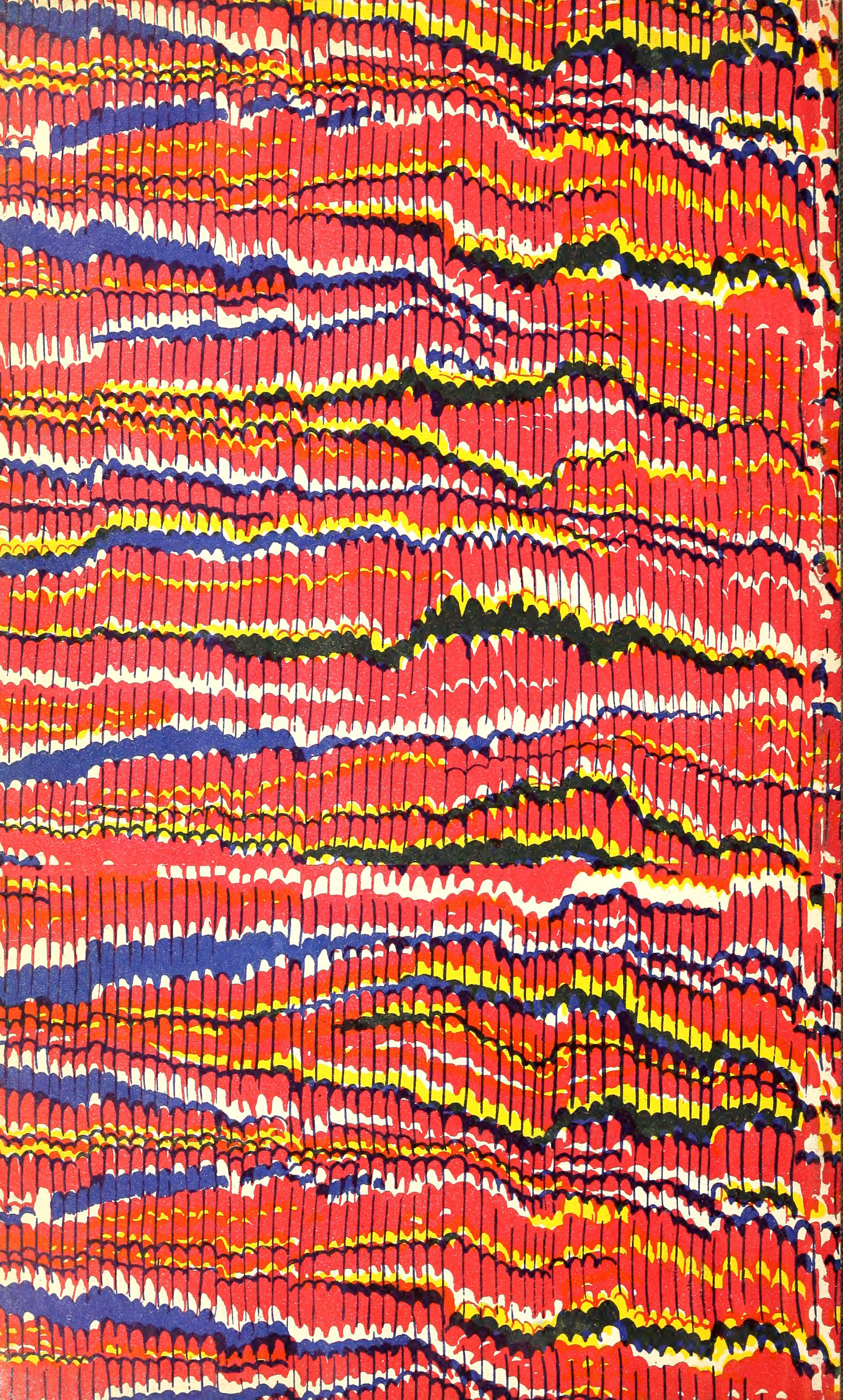

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